

Twenty-six New Species of Predaceous Ground Beetles (Coleoptera: Adephaga: Carabidae) from Ranomafana National Park, Madagascar

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As part of an inventory of the carabid beetle fauna of Ranomafana National Park, Fianarantsoa Province, Madagascar, we introduce 26 new species, for each of which the Park is designated as type locality: *Brachypelus ranomafanae* sp.nov., *Caelostomus latus* sp.nov., *C. rotundiformis* sp.nov., *Dactyleurys minimus* sp.nov., *D. ranomafanae* sp.nov., *Trichinillus* (Mallopelmus) *ranomafanae* sp.nov., *Chlaenius kathrynae* sp.nov., *C. robertae* sp.nov., *Omphreoides ranomafanae* sp.nov., *Perigona* (*Ripogena*) *deuvei* sp.nov., *P. (R.) ranomafanae* sp.nov., *Archicolliuris ranomafanae* sp.nov., *Thysanotus bimaculatoides* sp.nov., *Madecassina bimaculata* sp.nov., *M. quadrimaculata* sp.nov., *Pristacrus ranomafanae* sp.nov., *Eurydera ocellata* sp.nov., *E. oracle* sp.nov., *E. simplicia* sp.nov., *Pseudomasoreus ranomafanae* sp.nov., *Assadecma basilewskyi* sp.nov., *Lebia laterolucida* sp.nov., *L. ranomafanae* sp.nov., *L. apicoviolacea* sp.nov., *Eunostus minimus* sp.nov., and *Erephognathus ranomafanae* sp.nov. We provide information on type material, derivation of species name, features for recognition and known geographical and habitat distributions, as well as digital images of habitus and other key features for each species, all but two of which are currently known only from the type area.

KEYWORDS: Coleoptera, Carabidae, new species, Ranomafana National Park, Madagascar

Madagascar is one of the world's most important biodiversity hotspots (Myers 1998) and conservation priorities (Mittermeier et al. 2004, Brooks et al. 2006). Most of the species living in Madagascar are precinctive (Brooks et al. 2002, Goodman and Benstead 2004). For example, almost all of Madagascar's reptile and amphibian species, and all of its lemurs can be found nowhere else on the planet. The uniqueness of the Malagasy biota can be explained at least in part by its long period of geographic isolation (for more than 65 million years (Krause 2004)), its topographical variation, its diversity of climatic zones and its great diversity of habitats, from the deserts of the hot and dry southern region to the lush rainforests of the north and east.

About 1350 carabid beetle species have been documented as occurring in Madagascar, with most of them treated by Basilewsky (1973, 1976, 1985) and Jeannel (1946, 1948, 1949). Of the known species, about 95% are precinctive. The known distributional ranges of many of the species are limited to a single or only few localities, and the fauna of much of the island remains inadequately sampled and largely unknown. It's highly probable that the Malagasy fauna, when better known, will exceed 2,000 carabid species.

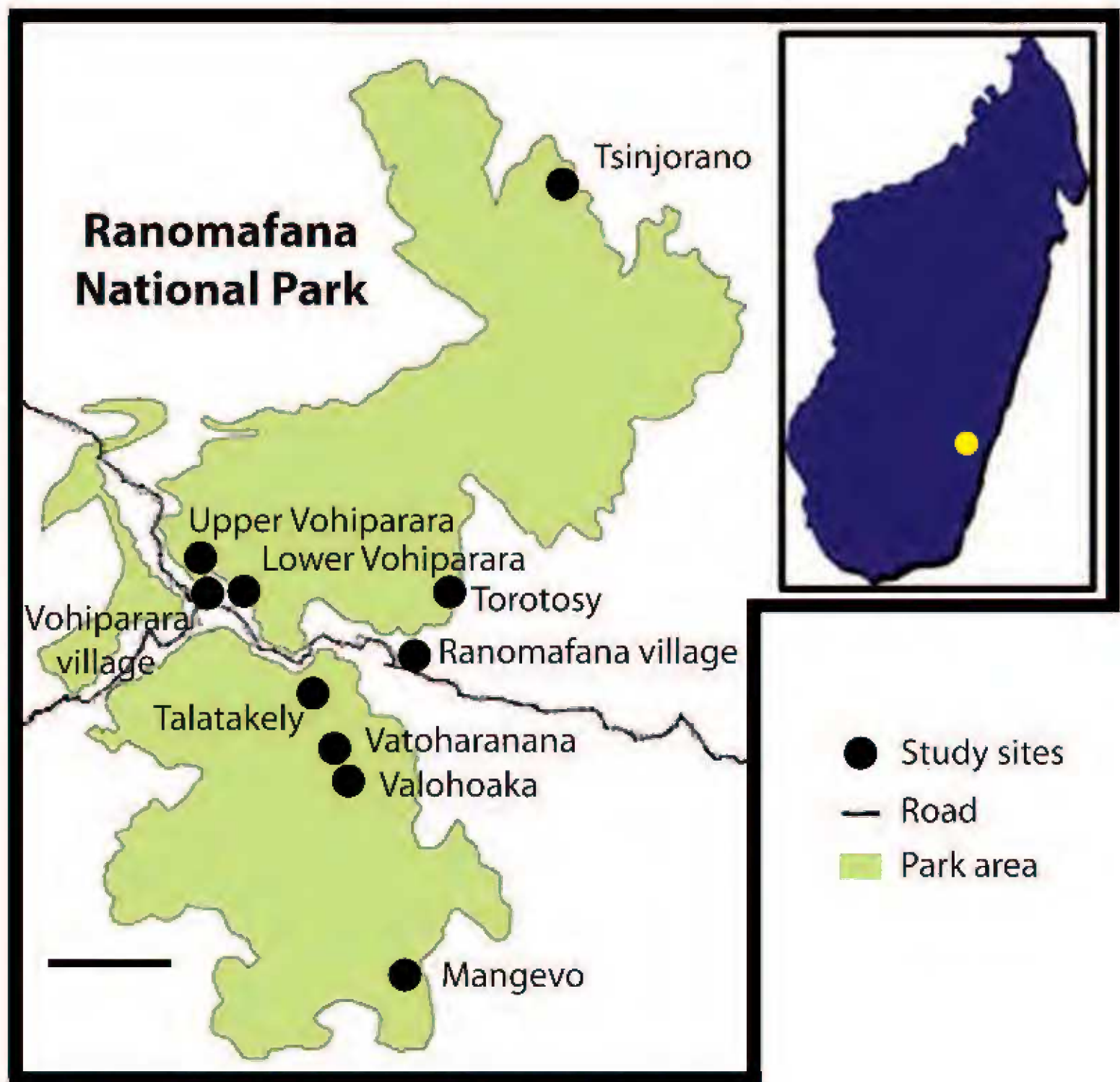


FIGURE 1. Map showing location of Ranomafana National Park in Madagascar (yellow dot in inset) and Park area, collecting sites and other places named in the text. Scale line = 5.0 km.

The geographical focus of this presentation is the carabid fauna of Ranomafana National Park (RNP), located in the southeastern part of the island, centered at about 21.25°S, 47.42°E (Fig. 1). Inaugurated in 1991 as the fourth national park in Madagascar, it is recognized both nationally and internationally as one of the world's most important conservation areas because of its exceptionally high species diversity and the immediate threat from human activity if not protected. It was included as part of the Rainforests of the Atsinanana World Heritage site in 2007. The park lies on the edge of Madagascar's High Plateau, with elevations ranging from 500 meters to 1,500 meters above sea level. The steepness of the slopes had preserved the park from exploitation before 1986. The range of altitudes allows for many different forest types, from lowland rainforest to cloud forest and high plateau forest. The park is divided into a core protected zone of 41,500 hectares surrounded by a peripheral (buffer) zone in which some exploitation of the forest is permitted. The peripheral zone contains more than 100 villages totalling more than 25,000 residents, most of them subsistence farmers.

Rainio and Niemala (2006) provided the first inventory of the carabid beetles of Ranomafana National Park. Their interest was to determine whether or not carabid beetles could be used as bioindicators of environmental change in and around the Park (Rainio and Niemälä 2003). Based on fieldwork between 2000 and 2005, they documented 127 carabid species in the fauna of the Park, including 37 species previously undescribed. Working independently, field teams from the California Academy of Sciences sampled the carabid fauna of the Park during several expeditions between 1998 and 2002 and raised the number of species known from RNP to more than 250, including nearly 50 new species.

The purpose of this presentation is to make the names of 26 of these new species available for use by systematists, ecologists and resource managers through the presentation of economic and efficient treatments for each (see Erwin & Johnson 2000) that satisfy the requirements of the International Commission on Zoological Nomenclature (ICZN 2000) for availability and validity. The remaining undescribed species, mostly platynines, will be treated in a separate paper to follow. A full inventory of the known carabid fauna of RNP, with habitat distributions for each species included, is in preparation.

MATERIALS AND METHODS

All but four of the new species described here were collected from Ranomafana National Park (RNP) or in the surrounding peripheral zone by our field teams during the period 1998–2005. Within the Park itself, collecting sites were located in both secondary (Talatakely and “Upper Vohiparara”) and primary montane forests (Vatoharanana and Valohoaka). Talatakely is low secondary montane forest, which was selectively logged in 1986–1989. The range of elevations at which specimens were collected in this area is from about 925 to 1000 m. “Upper Vohiparara” is our name given to a secondary montane forest site about 2 km northwest of Vohiparara village and accessible from there by both road and trails. The range of elevations at which specimens were collected in this area is from about 1140 to 1170 m. The Vatoharanana and Valohoaka sites are in primary montane rain forest, four and eight km south of Talatakely and at elevations of about 980 and 1080 m, respectively. At Vatoharanana, there has been some logging, but Valohoaka is undisturbed. The peripheral zone consists of a varied mosaic of cultivations, abandoned tavy-fields and forest edges. Within this peripheral zone, specimens were collected from the following villages and their environs: Mangevo, Ranomafana, Torotosy, Tsinjorano and Vohiparara (see Fig. 1)

Most specimens were collected by hand using the following methods: beating vegetation and accumulations of dead leaves in vegetation up to a height up to 3 m above ground; shaking trees and scraping bark and mossy and epiphytic coatings on them onto beating sheets; breaking into decaying logs; turning logs and stones on the forest floor. Collections were made during both day (DHK and JR) and night (DHK) hours using all of these methods. Pitfall trapping and sifting of forest litter with subsequent extraction using mini-Winkler extractors (Fisher 1998) were used as additional collecting methods.

MATERIALS.— This study is based on a total of 8,025 carabid specimens collected during the course of our respective field programs between 1998 and 2005 plus an additional 300 specimens from RNP borrowed from other collections (see below). About 265 different carabid species were represented in the material assembled, including the 26 new species described here. Except as noted in the text, holotypes were examined for all species mentioned in comparisons.

Codens used in this report for collections from which specimens were borrowed and/or in which specimens, including primary types, are deposited are as follows:

- CAS California Academy of Sciences, San Francisco, U.S.A.
EMEC Essig Museum of Entomology, University of California, Berkeley, California, U.S.A.
MZF Finnish Museum of Natural History, Helsinki, Finland
MNHN Muséum National d'Histoire Naturelle, Paris, France
MTEC Montana State University, Bozeman, Montana, U.S.A.
NMNH United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.

EXAMINATION OF SPECIMENS.— Specimens were examined using a Wild M5 and Leica MZ9.5 stereoscopic microscope with a Proline 80 LED Ring Illuminator.

MEASUREMENTS.— Measurements were made using a Leitz stereoscopic dissecting microscope with a calibrated ocular grid with a scale interval of 0.1 mm. The measurements used in this report include standardized body length (SBL), which equals the sum of head length (HL), measured from the apex of the clypeus to a point on the midline at the level of the posterior margin of the ocular swelling), pronotum length (PL), measured from the apical margin to the basal margin along the midline, and elytral length (EL), measured along the midline from the apex of the scutellum to the apex of the longer elytron. Readers should be aware that SBL is typically about 15% shorter than body length measured as a single distance from apex of the mandibles or labrum to apex of the elytra, and this difference should be considered when comparing length data presented here with length data in the literature. Nonetheless, we prefer SBL as a comparative of body length because it eliminates errors due to different alignments of body regions among different specimens. In distinguishing some species, we also use certain ratios as diagnostic features. These include the ratios of: pronotal width (PW) to pronotal length (PW/PL, with PW measured cross the pronotum at its widest point); elytral length to pronotal length (EL/PL); elytral length to elytral width (EW) (EL/EW, with EW measured across both elytra at their widest point); and standardized body length to elytral width (SBL/EW).

DISSECTIONS.— Male genitalia were extracted from specimens relaxed in water immediately after it had boiled and to which a few drops of liquid detergent had been added. Genitalic preparations were then cleared in hot 10% potassium hydroxide solution for five to 10 minutes, each constantly monitored to achieve only a useful degree of clearing. They were then rinsed briefly in 10% acetic acid and then repeatedly in distilled water. After examination, preparations were stored in glycerin in polyethylene microvials and pinned beneath their specimens of origin.

ILLUSTRATIONS.— Digital images of whole specimens and particular structures were taken using a Leica imaging system including an M165C dissecting microscope, DFC550 video camera, and two KL1500 LCD light sources. Stacked images were captured and combined into single montage images using the Leica Application Suite V4.2.0. Plates of images were created using Adobe Photoshop CS5.

SYSTEMATICS

The arrangement of species treatments and suprageneric classification used here follows Lorenz (2005), the most current world standard, rather than the arrangement and classification of Jeannel (1946, 1948, 1949). Several of Jeannel's suprageneric names are no longer in common use and the arrangement of taxa in his three-part work is different from that now recognized by most current carabid systematists.

Tribe Scaritini Bonelli 1810**Subtribe Clivinina Rafinesque 1815****Genus *Brachypelus* Putzeys 1866**

Jeannel (1946) included only two species in his treatment of this precinctive Malagasy genus, and Basilewsky (1976) described three additional species. Bulirsch et al. (2005) described eight new species and provided a key to all species known at that time. Finally, Bulirsch and Moravec (2009) described one more new species, *B. janaki*, bringing the total number of known species to 14. Members of the new species described below are easily distinguish from those of all the other described species on the basis of their unique combination of features compared with excellent key characters provided by Bulirsch et al. (2005).

***Brachypelus ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figures 2–3

Brachypelus n. sp.1; Rainio 2009: 31 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 2A–B), a female, in CAS, labeled: “MADAGASCAR Ranomafana NP. Talatakely, X, 130 m. 15.1.2001”/ “collected in pitfall trap on forest floor, F. Ratalata & J. Rainio collectors”/ “32.” [handwritten label]/ “HOLOTYPE *Brachypelus ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Large for genus, SBL = 6.8 mm. Members of this species (Fig. 2A) are most similar to those of *Brachypelus obesus* Putzeys (1866), with which they share large size, only six setae on the labrum, and a single discal setiferous pore on elytral interval 3 (at apical one-fifth). They differ from *B. obesus* members in the following: transverse fronto-clypeal suture present and deeply impressed (Fig. 3A) (absent from *B. obesus* members); frons with longitudinal frontal furrows narrower and shallower than in *B. obesus*; posterior lateral margins of the eyes broadly rounded (more narrowly and angularly rounded in *B. obesus* members); elytral base (Fig. 3B) straight between intervals 3 and obliquely sloped laterally from interval 4 (elytral base straight between intervals 4 and gradually rounded laterally from interval 3 in *B. obesus* members); elytra with lateral margin distinctly toothed at humerus (smoothly rounded at humerus, without a tooth in *B. obesus* members); and elytral intervals slightly convex apically (nearly flat in *B. obesus* members). Others species with members of comparably large size include *Brachypelus rolandi* Bulirsch et al. (2005), *Brachypelus betsileo* Bulirsch et al. (2005), *Brachypelas fischeri* Bulirsch et al. (2005) and *Brachypelus janaki* Bulirsch and Moravec (2009). However, *B. ranomafanae* members differ from those of *B. rolandi* in having the labrum with only six setae (seven in *B. rolandi* members), elytra widest at middle (anterior to middle in *B. rolandi* members), and elytral intervals moderately convex throughout (flattened apical in *B. rolandi* members). Members of both *B. betsileo* and *B. fis-*

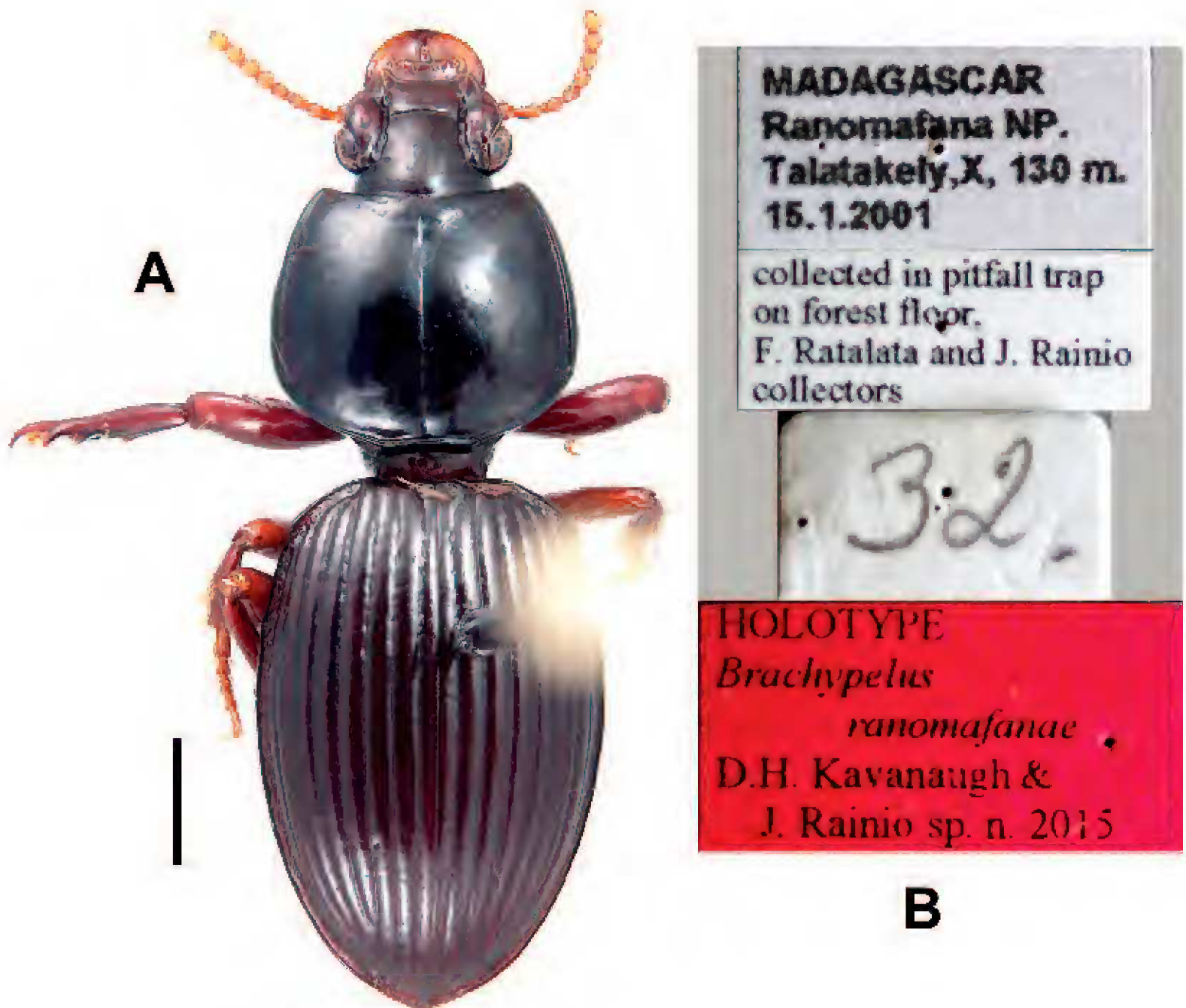


FIGURE 2. Digital images of holotype female of *Brachypelus ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

cheri have seven labral setae (whereas those of *B. ranomafanae* have only six) and lack discal setiferous pores (those of *B. ranomafanae* have a single setiferous pore in the apical one-fifth on interval 3. Finally, *B. ranomafanae* members differ from those of *B. janaki* in having only six setae on the labrum (seven labral setae in *B. janaki* members), the elytral margin with a distinct humeral tooth (tooth absent from *B. janaki* members), and only a single discal setiferous pore on elytral interval 3, with intervals 5 and 7 without such punctures (five or more such punctures on intervals 3, 5 and 7 in *B. janaki* members).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected in a pitfall trap placed in secondary montane rain forest in the Talatakely area, at an elevation of 900 m, at the 130 meter mark along Trail “X”. Vegetation in that area consisted of bamboo, small young trees and some larger trees with diameters at breast-height (DBH) of 20–30 cm. Tree trunks and branches were mostly covered with epiphytes and lianas.

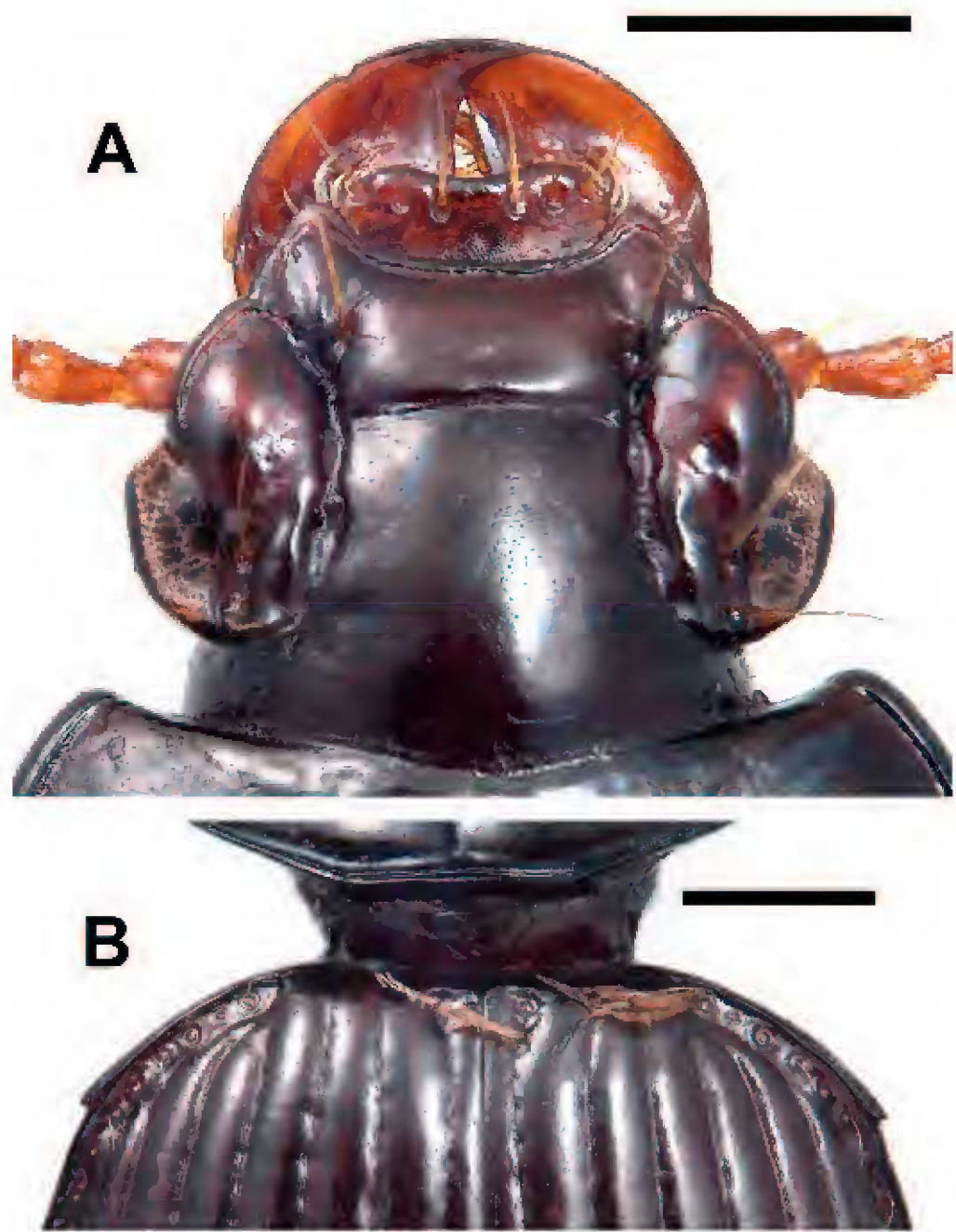


FIGURE 3. Digital images of holotype female of *Brachypelus ranomafanae* Kavanaugh & Rainio sp. nov. A. Head, dorsal aspect; B. Elytral base, dorsal aspect. Scale lines = 0.5 mm.

Cratocerini Lacordaire 1854

Phylogenetic relationships among the “Pterostichini” in the broadest sense and the cratocerines in particular remain largely unresolved (see Grzymala and Will (2014) for an example). We follow the classification as presented in Lorenz (2005).

Subtribe Drimostomatina Chaudoir 1872

Genus *Caelostomus* MacLeay 1825

***Caelostomus latus* Kavanaugh and Rainio, sp. nov.**

Figure 4

TYPE MATERIAL.— Holotype (Figs. 4A–B), a female, in CAS, labeled: “MADAGASCAR Ranomafana NP. Talatakely, Trail C, 350 m. 10.5.2005”/ “HOLOTYPE *Caelostomus latus* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

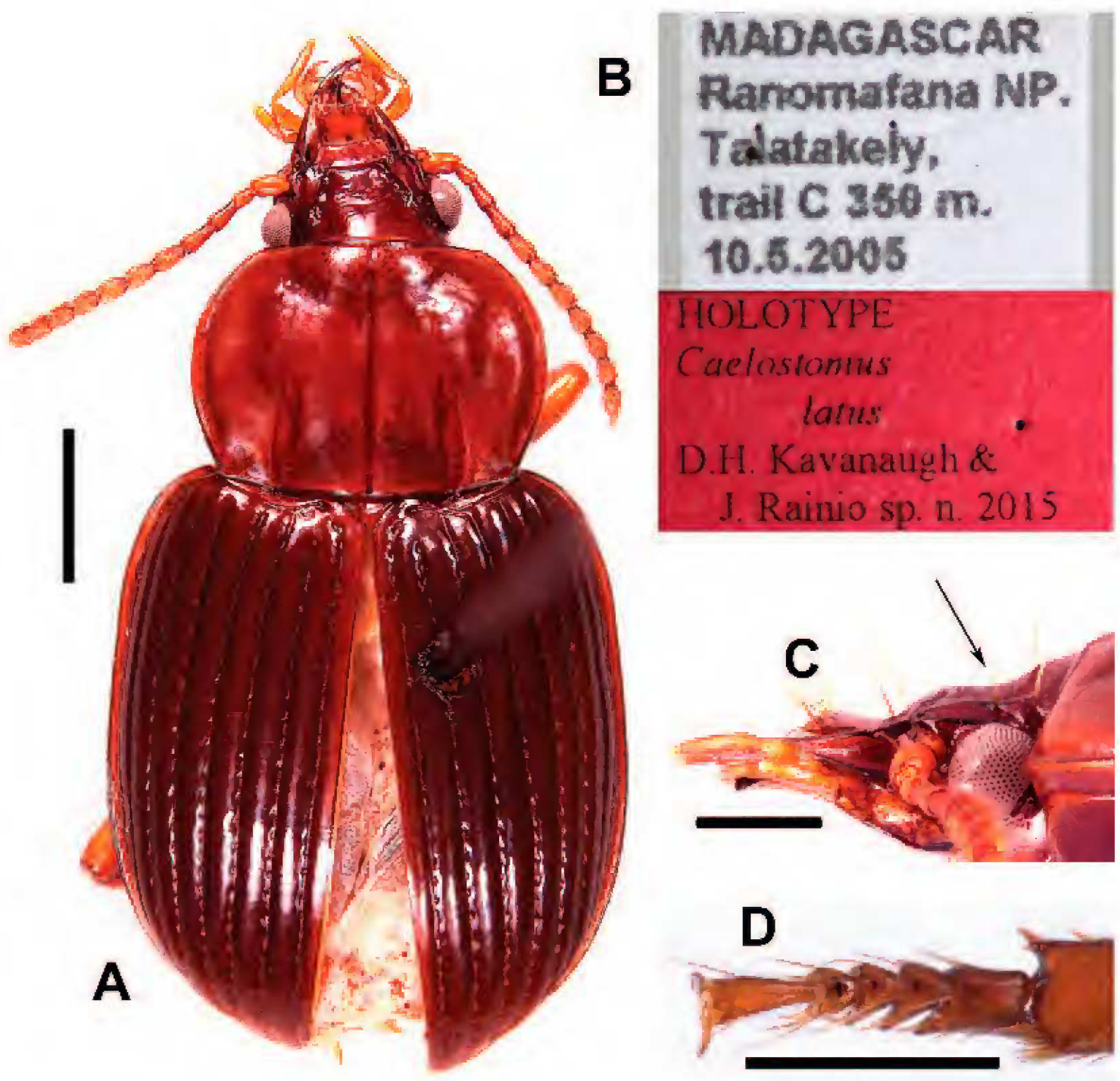


FIGURE 4. Digital images of holotype female of *Caelostomus latus* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C. Head, left lateral aspect (arrow points to transverse depression between eyes); D. Right anterior tarsus, dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.5 mm.

DERIVATION OF SPECIES NAME.— The species epithet, *latus*, is the Latin adjective meaning broad or wide, a reference to relatively broad pronotum of the holotype specimen and, presumably, other members of this species.

RECOGNITION.— Size moderate for genus, SBL = 6.3 mm. Based on Jeannel's (1948) key, this species is a member of subgenus *Caelostomus* s. str. Its members (Fig. 4A) share with those of other members of the subgenus the following features: head with frons and frontal furrows smooth, impunctate; elytral base distinctly margined from humerus medially to base of stria 3 or 2; elytral striae 6 and 7 deeply impressed throughout, not effaced apically; lateral elytral intervals narrow, moderately convex; apical part of umbilicate series of setiferous pores not inserted in a deep groove; and female apical abdominal ventrite with (two or) three pairs of setae subapically. Within the subgenus, the following features are shared only with members of two species of Jeannel's *convexiusculus* group, namely *Caelostomus convexiusculus* Tschitschérine (1899) and *Caelosto-*

mus alluaudi Jeannel (1948): SBL greater than 6.0 mm, elytra short and broad, ratio EL/EW = 1.19, elytral disc convex; and elytral intervals distinctly punctate throughout, including in apical part. The holotype female of *C. latus* is slightly larger than members of these other two species, has a distinct and broad transverse depression between the eyes seen best in lateral view (Fig. 4C) (depression absent from members of the other two species). The pronotum in the holotype of *C. latus* is much wider than in *C. convexiusculus* members, slightly wider than in *C. alluaudi* members, and less depressed anterolaterally than in members of either of the other species; and the pronotal basal foveae are straighter and more sharply defined laterally than in members of the other two species. The elytra are less abruptly rounded laterally and apically than in *C. alluaudi* members but similar to shape in to those in *C. convexiusculus* members. Finally, anterior tarsomeres 1 to 3 of the female holotype of *C. latus* are distinctly toothed medioapically (Fig. 4D), a feature not seen in females of the other two species.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype female was collected by hand in secondary montane forest in the Talatakely area.

***Caelostomus rotundiformis* Kavanaugh and Rainio, sp. nov.**

Figure 5

Caelostomus n. sp. 1; Rainio 2009: 31, Rainio 2012: 62 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 5A–B), a female, in CAS, labeled: “MADAGASCAR Ranomafana NP., Vatoharanana, Trail K at 50 m mark, 07.06.2000”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “13.” [handwritten label]/ “7.6.00 K 50” [handwritten label]/ “HOLOTYPE *Caelostomus rotundiformis* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in MNHN) labeled “MADAGASCAR Ranomafana NP. Talatakely, C1450 11.3.2004 Johanna Rainio leg.”/ “112.” [handwritten label]/ “PARATYPE *Caelostomus rotundiformis* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *rotundiformis*, is an adjective derived from the Latin words, *rotundus*, meaning round, and *forma*, meaning form or shape. The name refers to the very short, broad, rounded form of members of this species.

RECOGNITION.— Size moderately small for genus, SBL = 5.4–5.5 mm (females only), body form (Fig. 5A) short and broad, ratio SBL/EW = 1.97–2.01. This species is undoubtedly a member of genus *Caelostomus* as conceived by Jeannel (1948), although we cannot confirm this based on his key because he used male features only in two couplets to distinguish *Caelostomus* members from those of several other genera and we have only female specimens. However, we examined specimens of all species in all the other Malagasy caelostomine genera while at MNHN and confirmed that this species represents none of them. Observable female features, including body form short and broad, frontal furrows simple, not doubled, parascutellar striae of elytra indistinct, basal setiferous pore situated at base of elytral stria 3, tarsomeres not densely setose ventrally, and anterior tarsomere 4 not bilobed apically (Fig. 5C), are consistent with *Caelostomus* females. Within this genus, members of *C. rotundiformis* share the following features with those of other species of the nominate subgenus: head with frons and frontal furrows smooth, impunctate; elytral base distinctly margined from humerus medially to base of stria 3 or 2; elytral striae 6 and 7 deeply impressed throughout, not effaced apically; lateral elytral intervals narrow, moderately convex; apical part of umbilicate series of setiferous pores not inserted in a deep groove; and female apical abdominal ventrite with (two or) three pairs of setae subapically. However, members of this species

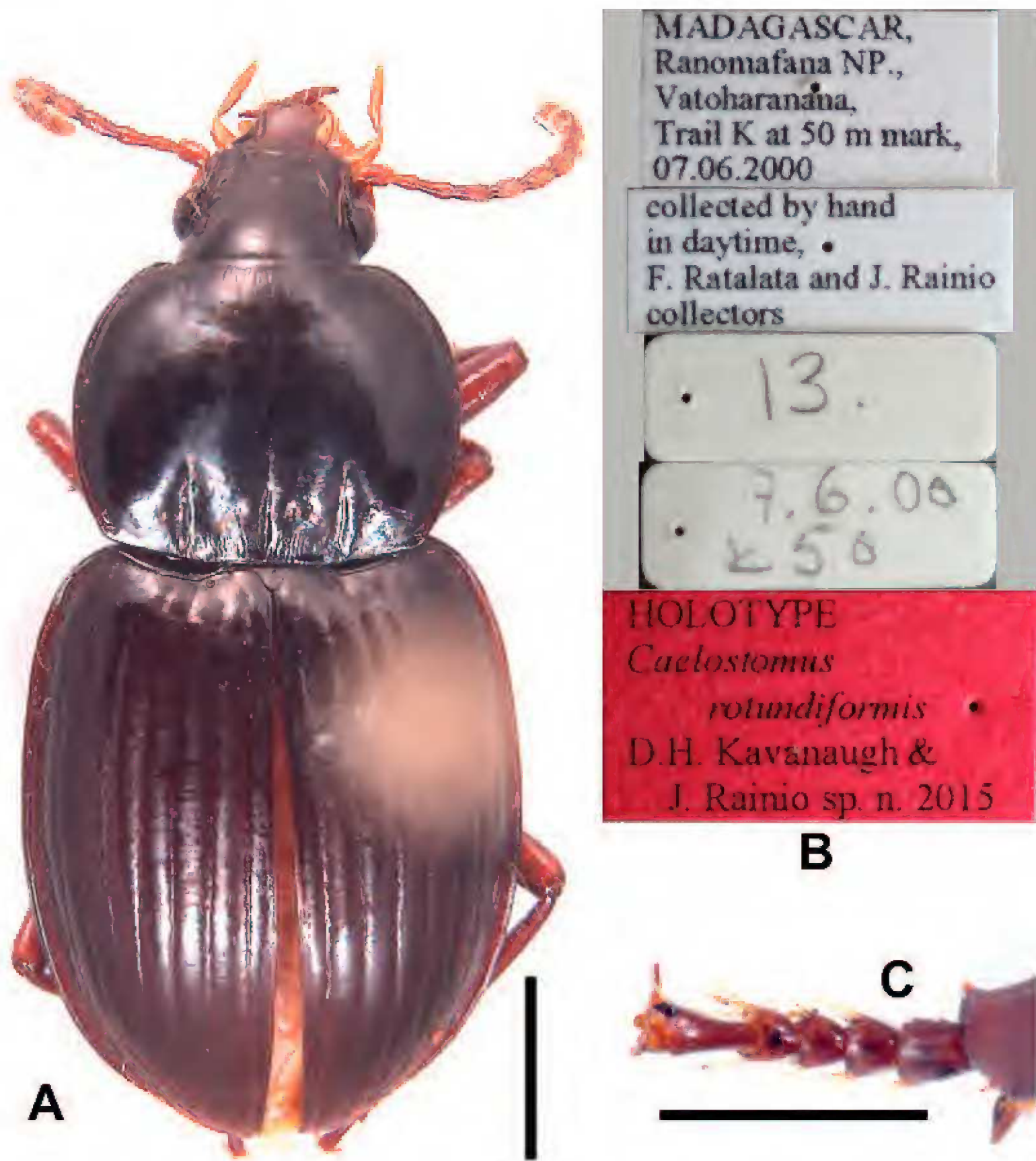


FIGURE 5. Digital images of holotype female of *Caelostomus rotundiformis* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C. Right anterior tarsus, dorsal aspect. Scale line A = 1.0 mm, C = 0.5 mm.

confound Jeannel’s (1948) key to species of *Caelostomus* s. str. Their short and broad elytra (ratio EL/EW = 1.13–1.15) are shared with members of the *convexusculus* species group, but their elytral striae are impunctate, whereas those of other species group members are markedly punctate throughout their length. Within the group, their small size (less than 6.0 mm) is shared with *Caelostomus humilis* (Tschitschérine 1903), *Caelostomus minisculus* Straneo (1940), and *Caelostomus minutissimus* Jeannel (1948); however, members of these three species are even smaller (SBL = 5.0 mm or less) and, again, have markedly punctate elytral striae. The striae in *C. rotundiformis* members are smooth, without evident punctures, and the shape of the pronotum

(Fig. 5A) is markedly different, with lateral margins evenly arcuate throughout their length and hind angles markedly obtuse. This species probably represents a distinct species group of its own within subgenus *Caelostomus* in Madagascar.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The holotype of this species was collected by hand in daytime in primary montane rain forest in the Vatoharanana area at an elevation of 1200 m, along Trail K at the 50 meter mark. The paratype specimen was collected in a pitfall trap in secondary montane rain forest in the Talatakely area at an elevation of 900 m, along Trail C at the 1450 meter mark.

Genus *Dactyleurys* Tschitschérine 1899

Jeannel (1948) recognized a single species in Madagascar, *Dactyleurys anomalus* Tschitschérine (1899) and no additional species have been described subsequently. The two new species described below bring the total for the genus to three species, all precinctive to Madagascar.

Dactyleurys minimus Kavanaugh and Rainio, sp. nov.

Figures 6, 8A, 9A, 9D

TYPE MATERIAL.— Holotype (Figs. 6A–B), a male, in CAS, labeled: “MADAGASCAR, Ranomafana NP, Talatakely, X at 130 m mark 12.4.2005”/ “collected by hand in daytime, F. Ratalata & Johanna Rainio collectors”/ “HOLOTYPE *Dactyleurys minimus* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *minimus*, is the Latin adjective meaning smallest, a reference to fact that the known adult male of this species is smaller than males of any of the other known species that we have examined.

RECOGNITION.— Smallest adult known for the genus, SBL = 6.9 mm. The following combination of features identify members of this species as coelostomine pterostichines of the genus *Dactyleurys*: antennae with antennomere 3 attached symmetrically or nearly symmetrically to antennomere 2; mentum with deep emargination, apex of median mental tooth distinctly posterior to apices of epilobes; elytron with epipleuron interrupted by internal plica subapically; parascutellar stria not evident; basal setiferous puncture situated at base of stria 3; tarsomeres 1 to 4 of all legs with dense pads of setae ventrally; front and middle tarsomeres 1 to 3 smoothly convex dorsally; male front tarsomeres 1 to 4 wide, dilated, not latero- or medioapically toothed; aedeagus of male with right face dorsal in repose, right paramere conchoid, left paramere reduced, short, apically digitiform. Members of *D. minimus* (Fig. 6A) differ from those of *D. anomalus* in the following features: smaller size (SBL = 6.9 mm compared with 7.7–9.4 mm in *D. anomalus*); pronotum (Fig. 8A) relatively narrower, widest at middle (relatively wider (Fig. 8C) and clearly widest anterior to middle in *D. anomalus*); elytra faintly but evidently iridescence and elytral microsculpture markedly transverse with sculpticells great than 2.5 times as wide as long (elytra not iridescent and elytral microsculpture moderately transverse with sculpticells less than 2.5 times as wide as long in *D. anomalus*); and median lobe of male genitalia (Fig. 9A) with shaft abruptly bent ventrally in apical fourth with apex nearly straight in lateral aspect (shaft nearly straight ventrally (Fig. 8C) in apical fourth with apex slightly recurved dorsally in *D. anomalus*), apex narrowly rounded in dorsal aspect (Fig. 9D) (more broadly rounded (Fig. 9F) in *D. anomalus*). Members of *D. minimus* differ from those of the other new species, *Dactyleurys ranomafanae*, in the following fea-

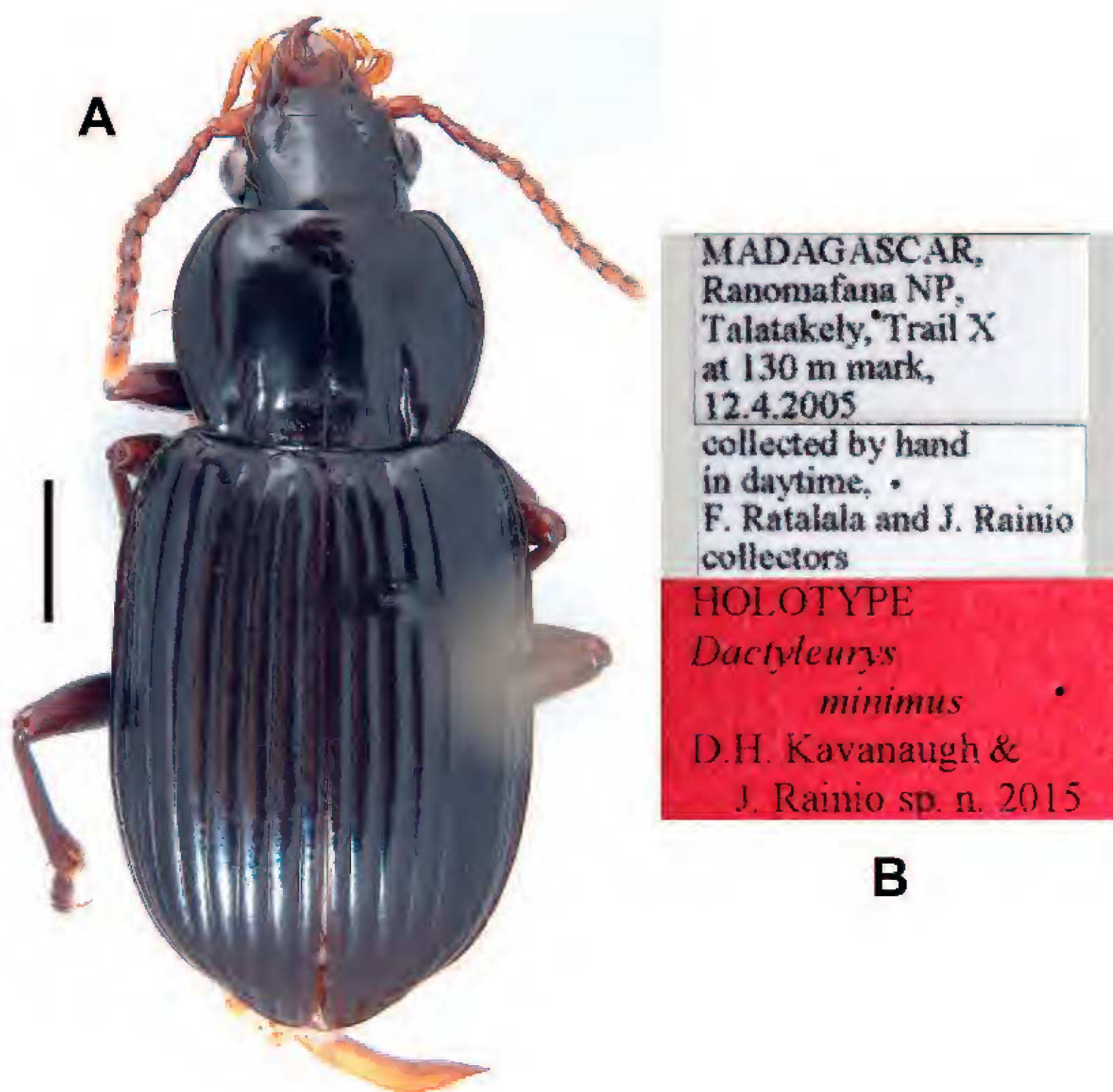


FIGURE 6. Digital images of holotype male of *Dactyleurys minimus* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

tures: smaller size (SBL = 7.7–8.3 mm in *D. ranomafanae*); pronotum (Fig. 8A) relatively narrower and with evenly rounded lateral margin (slightly wider (Fig. 8B) and with lateral margin slightly straighter in basal one-third in *D. ranomafanae*); and median lobe of male genitalia (Fig. 9A) with apex nearly straight in lateral aspect (apex slightly recurved dorsally (Fig. 9C) in *D. ranomafanae*), apical part of shaft (Fig. 9D) slightly deflected right in dorsal aspect (apical part of shaft (Fig. 9E) straight in *D. ranomafanae*).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected by hand in daytime in secondary montane rain forest in the Talatakely area, at an elevation of 900 m, at the 130 meter mark along Trail “X”. Vegetation in that area consisted of bamboo, small young trees and some larger trees with diameters at breast-height (DBH) of 20–30 cm. Tree trunks and branches were heavily laden with epiphytes and lianas.

***Dactyleurys ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figures 7, 8B, 9B, 9E

Dactyleurys n. sp. 1; Rainio 2009: 31, Rainio 2012: 62, Rainio 2013: 95 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 7A–B), a male, in CAS, labeled: “CASENT 1009744”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 26 April 1998”/ “21°15.3’S/ 47°25.9’E, Stop #98-83 D.H. Kavanaugh collector collected by beating *Pandanus* tree boluses with debris”/ “HOLOTYPE *Dactyleurys ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (a total of 35): 1 male (in MZF) labeled “MADAGASCAR Ranomafana NP. Mangevo, plot 0 m., 21.4.2005”; 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Mangevo, plot 100 m., 21.4.2005”; 2 females (in CAS) labeled same as holotype except “CASENT 1009742” and “CASENT 1009743”, respectively; 3 males and 2 females (in CAS) labeled “CASENT 1009737”, “CASENT 1009738”, “CASENT 1009739”, “CASENT 1009740” and “CASENT 1009741”, respectively/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 25 April 1998”/ “21°15.3’S/ 47°25.9’E, Stop #98-78 D.H. Kavanaugh collector beaten from vegetation and suspended dead leaves”; 3 males and 2 females (in CAS and MNHN) labeled “CASENT 1009734”, “CASENT 1009735”, “CASENT 1009736”, “CASENT 1009732” and “CASENT 1009733”, respectively/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by beating live understory vegetation and/or dead leaves and other suspended debris”; 1 male and 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, 26.2.2001”; 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail B 1150 m., in *Pandanus* sp. 8.6.2000”; 1 male and 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail BF 380 m., in *Pandanus* sp. 16.6.2000”; 1 male and 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail BM 200 m., in *Pandanus* sp. 16.6.2000”; 1 male and 2 females (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail FBF 50 m., in *Pandanus* sp. 6.6.2000”; 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail FBF 380 m., in *Pandanus* sp. 6.6.2000”; 2 females (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail SP 50 m., 22.3.2001”; 1 female (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail SP 50 m., 9.2.2005”; 1 male (in MZF) labeled “MADAGASCAR Ranomafana NP. Talatakely, trail X 130 m., 12.4.2005”; 1 male (in MNHN) labeled “MADAGASCAR Ranomafana NP. Valohoaka, trail F 900 m., 28.2.2001”; 1 male (in MZF) labeled “MADAGASCAR Ranomafana NP. Valohoaka, trail F 850 m., 16.10.2002”; 1 male (in MNHN) labeled “MADAGASCAR Ranomafana NP. Valohoaka, trail F 850 m down., 18.12.2004”; 1 female (in MNHN) labeled “MADAGASCAR Ranomafana NP. Valohoaka, trail F 850 m., 25.1.2005”; 2 males and 1 female (in MNHN and MZF) labeled “MADAGASCAR Ranomafana NP. Valohoaka, trail F 850 m., 26.1.2005”. All paratypes also bear the following label: “PARATYPE *Dactyleurys ranomafanae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size average for genus, SBL of males = 7.7–8.2 mm, of females = 7.8–8.4 mm. The following combination of features identify members of this species as coelostomine

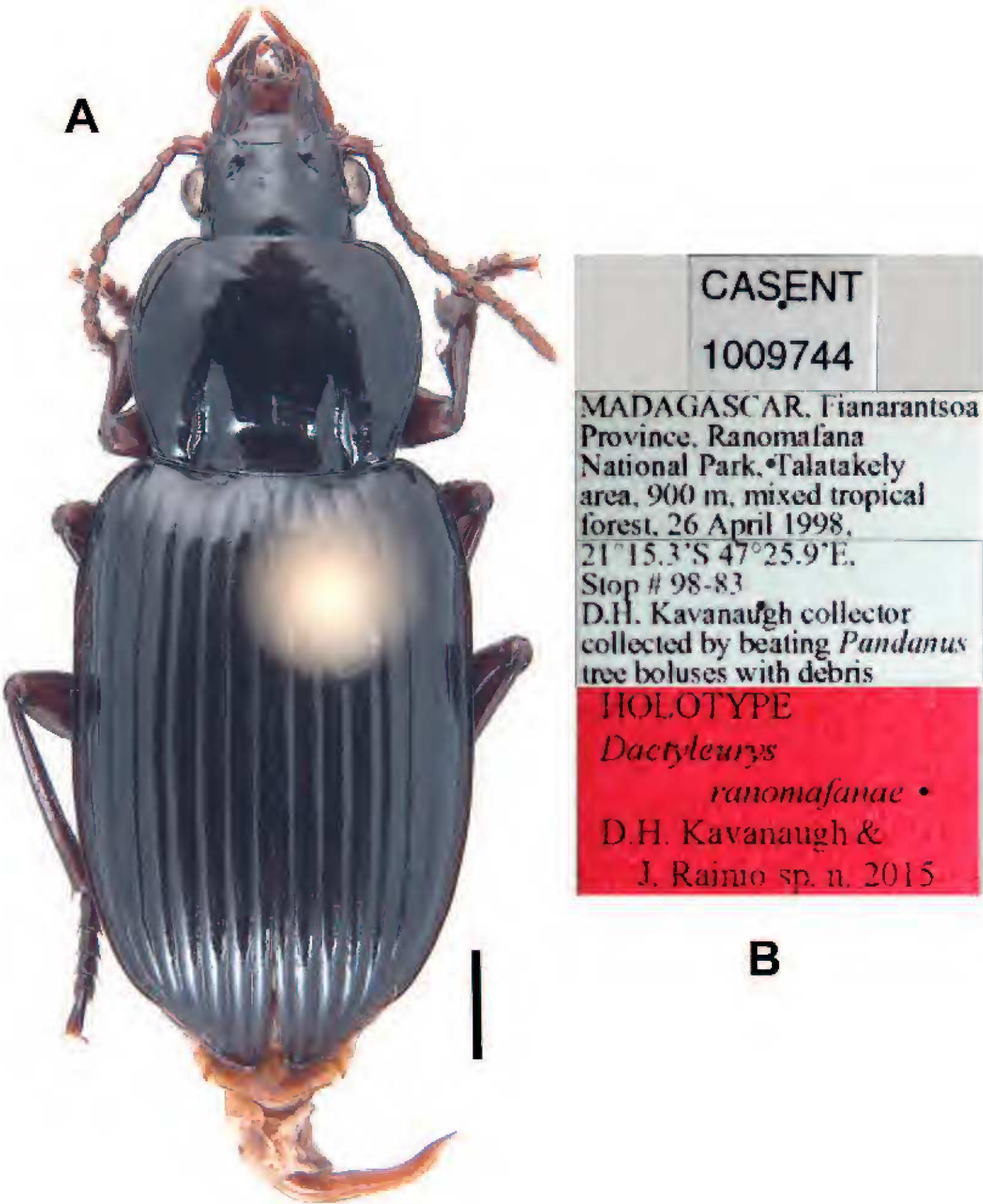


FIGURE 7. Digital images of holotype male of *Dactyleurys ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

pterostichines of the genus *Dactyleurys*: antennae with antennomere 3 attached symmetrically or nearly symmetrically to antennomere 2; mentum with deep emargination, apex of median mental tooth distinctly posterior to apices of epilobes; elytron with epipleuron interrupted by internal plica subapically; parascutellar stria not evident; basal setiferous puncture situated at base of stria 3; tarsomeres 1 to 4 of all legs with dense pads of setae ventrally; front and middle tarsomeres 1 to 3 smoothly convex dorsally; male front tarsomeres 1 to 4 wide, dilated, not latero- or medioapically toothed; aedeagus of male with right face dorsal in repose, right paramere conchoid, left paramere reduced, short, apically digitiform. Members of *D. ranomafanae* (Fig. 7A) differ from those of *D. anomalus* in the following features: pronotum (Fig. 8B) widest at middle (distinctly widest anterior to middle (Fig. 8C) in *D. anomalus*); elytra faintly but evidently iridescence and elytral microsculpture markedly transverse with sculpticells great than 2.5 times as wide as long (elytra not iridescent and elytral microsculpture moderately transverse with sculpticells less than 2.5 times as wide as long in *D. anomalus*); and median lobe of male genitalia (Fig. 9B) with shaft abruptly bent ventrally in apical fourth (shaft nearly straight ventrally (Fig. 8C) in apical fourth in *D. anomalus*), apex narrowly rounded in dorsal aspect (Fig. 9E) (more broadly rounded (Fig. 9F) in *D. anomalus*). Members of *D. ranomafanae* differ from those of the other new species, *D. minimus*, in the following features: larger size, SBL = 7.7–8.3 mm (size smaller, SBL = 6.9, in *D. minimus*); pronotum

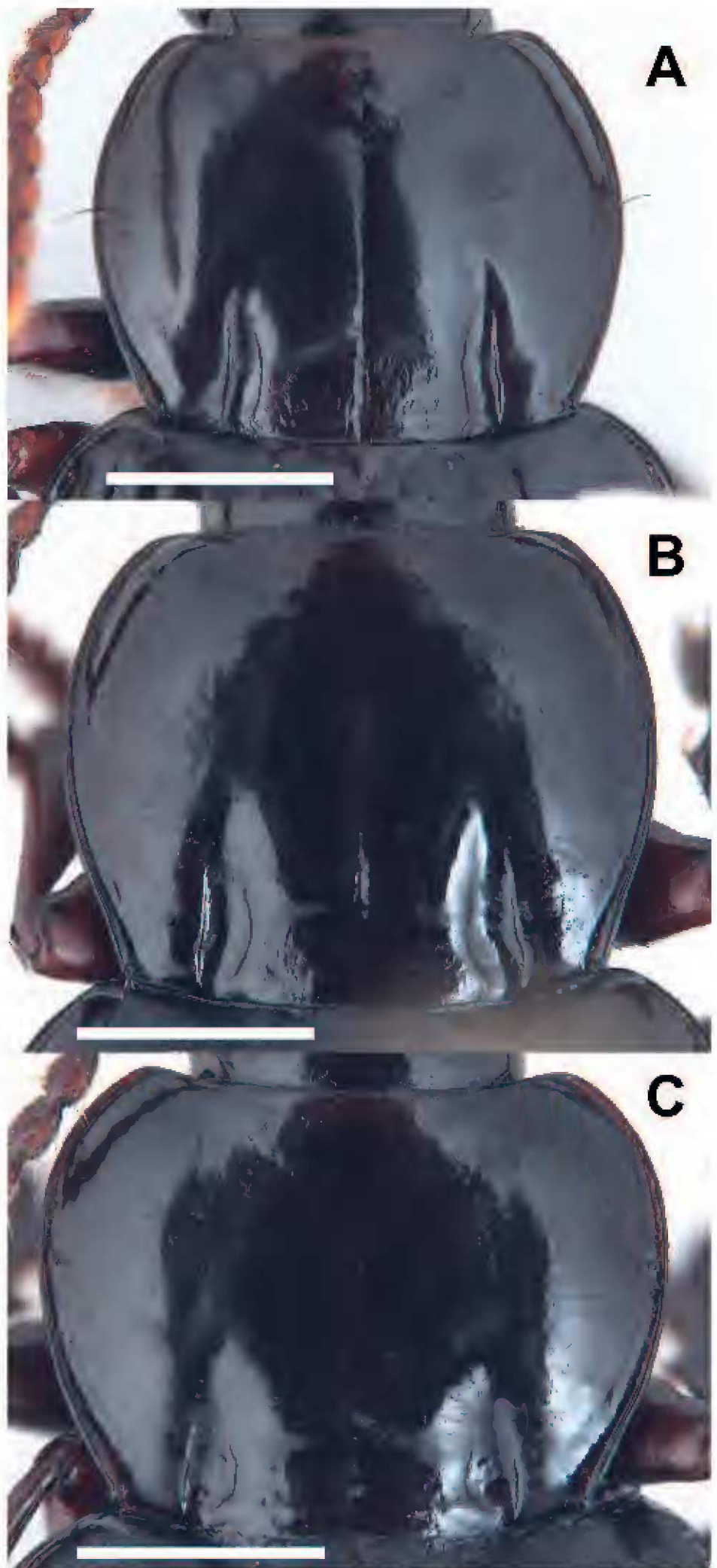


FIGURE 8. Digital images of pronota of *Dactyleurys* spp., dorsal aspect. A. Holotype of *D. minimus* Kavanaugh & Rainio sp. nov.; B. Holotype of *D. ranomafanae* Kavanaugh & Rainio sp. nov.; C. *D. anomalus* Tschitschérine. Scale lines = 1.0 mm

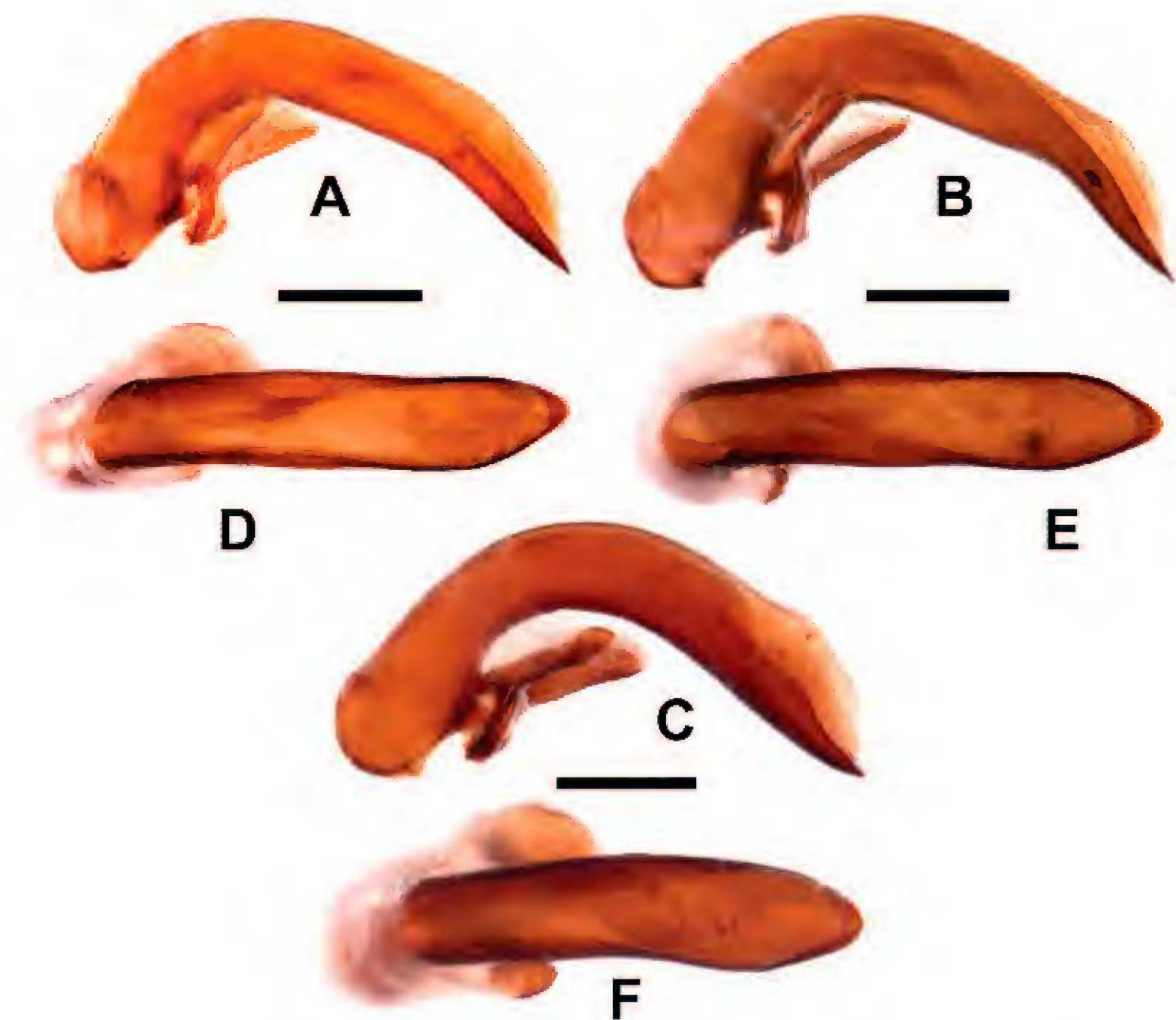


FIGURE 9. Digital images of aedeagus of male genitalia of *Dactyleurys* spp. A–C. left lateral aspect; D–F. dorsal aspect. A, D. Holotype of *D. minimus* Kavanaugh & Rainio sp. nov.; B, E. Holotype of *D. ranomafanae* Kavanaugh & Rainio sp. nov.; C, F. *D. anomalus* Tschitschérine. Scale lines = 0.5 mm.

(Fig. 8B) relatively broader and with lateral margins slightly straighter in basal one-third (slightly narrower and with lateral margins more evenly rounded (Fig. 8A) in *D. minimus*); and median lobe of male genitalia (Fig. 9B) with apex slightly recurved dorsally in lateral aspect (apex (Fig. 9A) nearly straight in *D. minimus*), apical part of shaft (Fig. 9E) straight (apical part of shaft slightly deflected right (Fig. 9D) in *D. minimus*).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Specimens of this species have been collected in both primary and secondary montane rainforest throughout RNP, at elevations ranging from of 900 to 1180 m. Most of the specimens were collected by beating vegetation, especially plants of *Pandanus* sp., and suspended accumulations of dead vegetative debris in shrubs and understory trees. One was collected in a malaise trap, another sifted from forest litter at the primary forest site, and another by hand at the secondary forest site.

Genus *Trichinillus* Straneo 1938
Subgenus *Mallopelmus* Straneo 1942

Mallopelmus Alluaud 1936, unavailable

Alluaud (1936) described this taxon as a new genus with several included species, but he failed to designate one of them as type species. This error rendered the name unavailable (ICZN 2000, Article 13.3) until Straneo (1942) designated *Mallopelmus dactyleuryoides* Alluaud (1936) (the first named species in Alluaud's (1936) paper) as the type species. Both Straneo (1938) and Jeannel (1948) treated *Mallopelmus* as a distinct genus. Straneo actually treated *Trichinillus* as a subgenus of *Mallopelmus* in his 1942 paper, apparently not realizing at the time that his designation of a type species for *Mallopelmus* changed the data of availability for that name, as well as its authorship, with the result that *Trichinillus* became the senior synonym for the genus. *Mallopelmus* is now considered a subgenus of *Trichinillus* (Lorenz 2005) and is precinctive to Madagascar.

***Trichinillus (Mallopelmus) ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figure 10

Mallopelmus n. sp. 1; Rainio 2009: 32, Rainio 2012: 74 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 10A–B), a male, in CAS, labeled: “MADAGASCAR Ranomafana NP. Buffer zone, degraded forest 14.10.2002”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “HOLOTYPE *Trichinillus (Mallopelmus) ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in MNHN) labelled “MADAGASCAR Ranomafana NP. Talatakely, trail B, 600 m. 05.03.2004”/ “collected by hand in daytime from dead leaves in bushes, F. Ratalata and J. Rainio collectors”/ “PARATYPE *Trichinillus (Mallopelmus) ranomafanae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Slightly smaller than average for subgenus, SBL male = 7.2 mm, female = 7.5 mm. The following combination of features identify members of this species as coelostomine pterostichines of the genus *Trichinillus*, subgenus *Mallopelmus*: antennae with antennomere 3 attached symmetrically or nearly symmetrically to antennomere 2; mentum with deep emargination, apex of median mental tooth distinctly posterior to apices of epilobes; elytron with epipleuron interrupted by internal plica subapically; parascutellar stria short but evident; striae smooth, impunctate; basal setiferous puncture situated at base of stria 2 + parascutellar stria; tarsomeres 1 to 4 of all legs with dense pads of setae ventrally; front and middle tarsomeres 1 to 3 with more or less faintly-defined longitudinal groove medially and depressed areas paralaterally on dorsal surface; male front tarsomeres 1 to 4 wide, dilated, not latero- or medioapically toothed; aedeagus of male with right face dorsal in repose, right paramere conchoid, left paramere reduced, short, apically digitiform. Of the three previously described species represented in Jeannel's (1948) key to *Mallopelmus* species, members of *T. ranomafanae* (Fig. 10A) are most similar to *Trichinillus abacetoides* (Alluaud 1936) members based on the following shared features: head with temporal area long, nearly as long as the diameter of the eye, and joined to the neck region at a very obtuse (about 165°) angle; eyes moderately convex and projected; pronotum with basal area distinctly and abruptly depressed relative to disc; and elytral base without margination medial to base of stria 6. Members of the other two species, *Trichinillus dactyleuryoides* (Alluaud 1936) and *Trichinillus perrieri* (Jeannel 1948), differ in having the head with the temporal area shorter, about one-third as

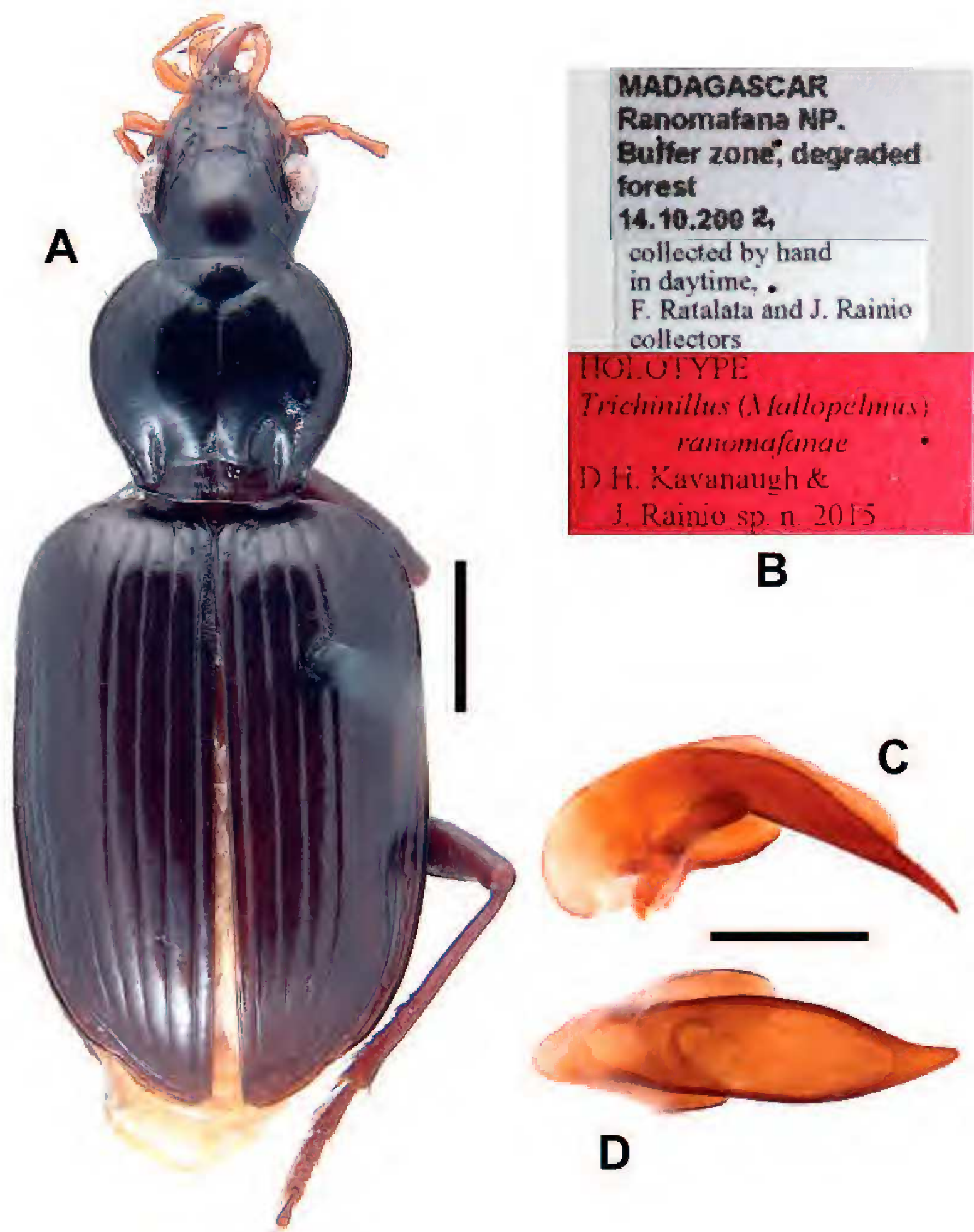


FIGURE 10. Digital images of holotype male of *Trichinillus (Mallopelmus) ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C–D. Aedeagus of genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.5 mm.

long as the diameter of the eye, and joined to the neck region at a moderately obtuse (about 135°) angle, eyes more convex and projected, pronotum not or less depressed, especially medially, and margination of the elytra base more varied, extended medially to the base of stria 3 in most individuals). The apex of the median lobe of the male genitalia is also differently shaped in each of these species (compare with Figs. 191c-d and 191f-g, respectively, in Jeannel 1948). Members of *T. ranomafanae* differ from those of *T. abacetoides* in having: slightly larger size (SBL = 6.4 mm in *T. abacetoides*); pronotum with shallow but distinct subbasal sinuation of the lateral margin (absent from *T. abacetoides* members); elytra relatively shorter and wider, especially across the base, and humeri broadly rounded and not at all sloped (humeri more slope in *T. abacetoides*, and median lobe of male genitalia with apex straighter, slightly bent ventrally toward apex in lateral aspect (Fig. 10C) and slightly deflect right in dorsal view (Fig. 10D) (not recurved dorsally and then ventrally in lateral aspect and straight in dorsal aspect as in *T. abacetoides* males; compare with Fig. 191e in Jeannel 1948)

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The male holotype of *T. ranomafanae* was collected in degraded secondary montane rainforest at an elevation of 800 m, near a village in the peripheral zone of Ranomafana National Park about 1000 meters from the main gate. The female paratype was collected in secondary montane rainforest in the Talatakely area, at an elevation of 900 m, at the 600 m mark along Trail B. Vegetation in this area was dominated by young trees (DBH < 10 cm) and guava (*Psidium cattleianum*).

Tribe Chlaeniini Brullé 1834

Genus *Chlaenius* Bonelli 1810

Jeannel (1949) treated *Chlaenites* Motschulsky (1860) as a distinct genus, although it is now considered a subgenus of *Chlaenius* (Lorenz 2005) and includes only two species, both from the Palaearctic Region. Both of the new species described below key to *Chlaenites* in Jeannel's (1949) key to chlaeniine genera, but neither is a member of that subgenus as presently conceived.

Chlaenius kathrynae Kavanaugh and Rainio, sp. nov.

Figure 11

TYPE MATERIAL.— Holotype (Figs. 11A–B), a male, in CAS, labeled: “CASENT 1002782”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1150 m, mixed tropical forest, 2-22 January 2001,”/ “21.24032°S/ 47.39399°E, Stop# DHK-01-002, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, Ranaivosolo,”/ “E.F. Randrianifirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by treading marsh vegetation and shore”/ “HOLOTYPE *Chlaenius kathrynae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 8): 4 males (in CAS, MNHN and MZF) and 1 female (in CAS) labeled same as holotype except “CASENT 1002783”, “CASENT 1002784”, “CASENT 1002786”, “CASENT 1002787”, and “CASENT 1002785”, respectively; 1 male (CAS) labeled “CASENT 1049008”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1050 m, mixed tropical forest, 23 April 1998,”/ “21°13.6'S/ 47°23.0'E,”/ “Stop # 98-71, D.H. Kavanaugh collector collected in soil cracks, under dirt clods, and under root clods in abandoned rice paddy area”; 2 females (in MTEC) labeled “MADAGASCAR: Fianaran. Pr. Ranomafana N.P. HQ. area 21°15'24"S 47°25'15"E 25NOV1994, at night M.A. Ivie & D.A. Pollock”. All paratypes also bear the following label: “PARATYPE *Chlaenius kathrynae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

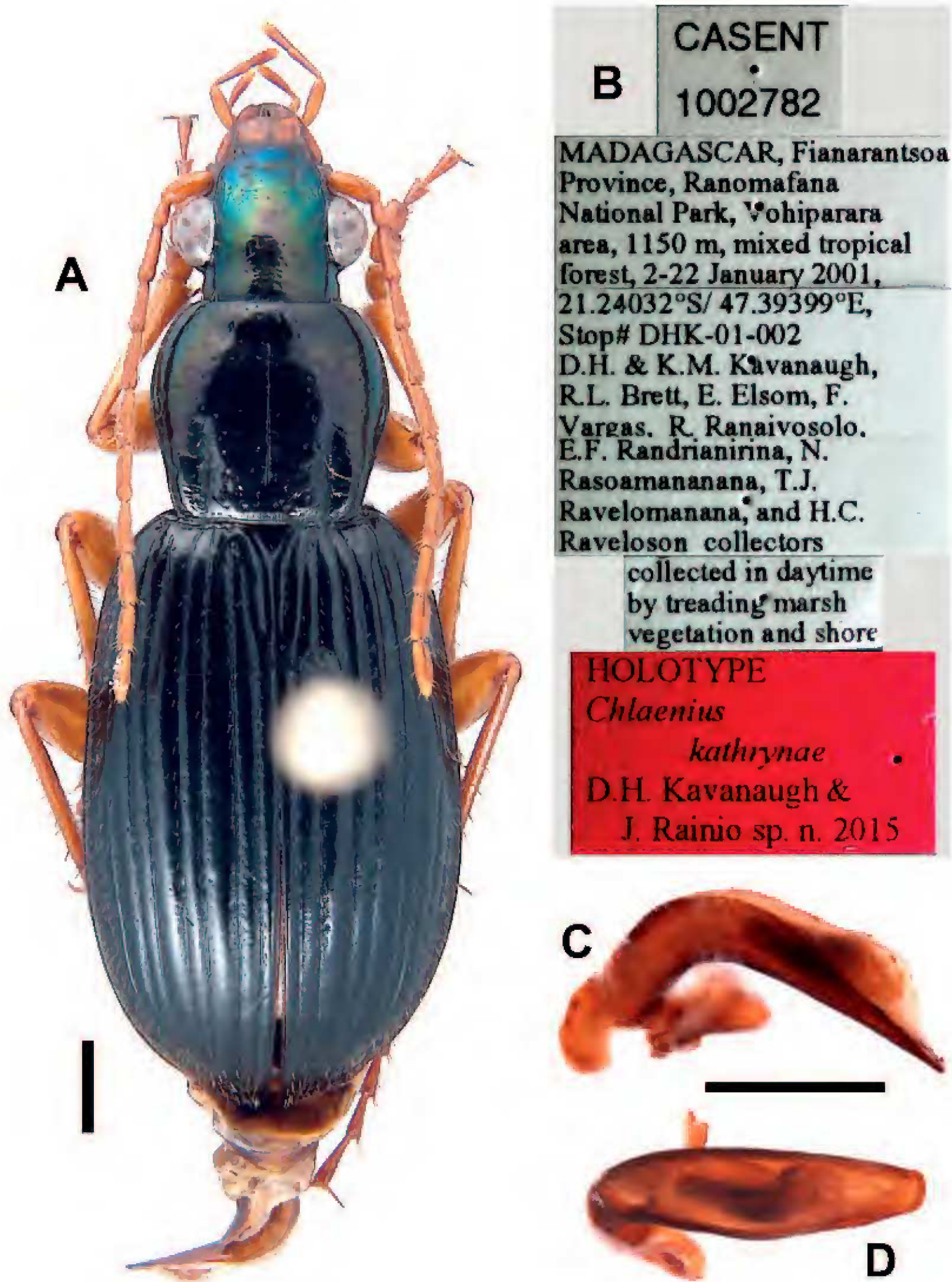


FIGURE 11. Digital images of holotype male of *Chlaenius kathrynae* Kavanaugh & Rainio sp. nov. A Habitus, dorsal aspect; B. Labels; C–D. Aedeagus of genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines = 1.0 mm.

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *kathrynae*, is a noun in the genitive case, derived from the first given name of Kathryn May Kavanaugh, daughter of DHK and one of the collectors of the type series.

RECOGNITION.— Size slightly below average for genus, SBL of males = 10.2–10.8 mm, of females 9.8–11.1 mm. Members of this species (Fig. 11A) share the following features, which place them in genus *Chlaenites* sense Jeannel (1948): antennomere 3 longer than antennomere 4; maxillary palpi setose, penultimate labial palpomeres 4 or 5 setose; pronotum with basolateral setae inserted distinctly anterior to the hind angles; elytra with pubescence restricted to near the striae on disk (*i.e.*, not present on the centers of intervals), except more generally and densely present on lateral intervals and near apices; and tarsi asetose dorsally, tarsomeres 5 with two rows of stout setae ventrally. In Jeannel's (1949) key to subgenera of *Chlaenites*, members of this species key best, although not fully, to subgenus *Chlaeniostenus* Kuntzen (1919), which is now considered a subgenus of *Chlaenius* (Lorenz 2005). Shared with other Malagasy members of this subgenus are the following features: pronotum relatively narrow, more or less cordiform, narrowed basally, with the anterior angles not projected anterior of the basal margin and the anterolateral areas of the pronotum distinctly curved ventrally; and the setose punctures along the lateral margins of the elytral intervals not or only faintly evident, most clearly evident in the apical half only. Jeannel included three other species in this subgenus; namely, *Chlaenius attenuatus* Klug (1833), *Chlaenius subovatus* Chaudoir (1876), and *Chlaenius sellatus* Dejean (1831). Members of *C. kathrynae* differ from those of the other species in lacking any trace of the pale lateral and apical elytral border distinct in members of the other three species. They are also smaller than members of the other species (SBL in the latter ranges from 11.9 to 15.3 mm), have slightly broader and less cordiform pronota and males have genitalia (Figs. 11C–D) that are very different in form from those of any of the other species (compare with Jeannel's (1949) Figs. 388c–i)

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Most specimens of the type series were collected in open habitats at the edges of mixed tropical forest in the Vohiparara area at an elevation of 1050 m. Several were collected by treading down vegetation at the edge of a marsh, and one specimen was found under loose dirt and root clods in an abandoned rice paddy area.

***Chlaenius robertae* Kavanaugh and Rainio, sp. nov.**

Figure 12

TYPE MATERIAL.— Holotype (Figs. 12A–B), a male, in CAS, labeled: “CASENT 1002781”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1150 m, mixed tropical forest, 2–22 January 2001,”/ “21.24032°S/ 47.39399°E, Stop# DHK-01-002, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, Ranaivosolo,”/ “E.F. Randrianifirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by treading marsh vegetation and shore”/ “HOLOTYPE *Chlaenius robertae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in CAS) labeled “CASENT1049009”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1050 m, mixed tropical forest, 27 April 1998,”/ “21°13.6'S/ 47°23.0'E,”/ “Stop # 98-91, D.H. Kavanaugh collector collected on bare soil at night in abandoned rice paddy area”/ “PARATYPE *Chlaenius robertae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *robertae*, is a noun in the genitive case,

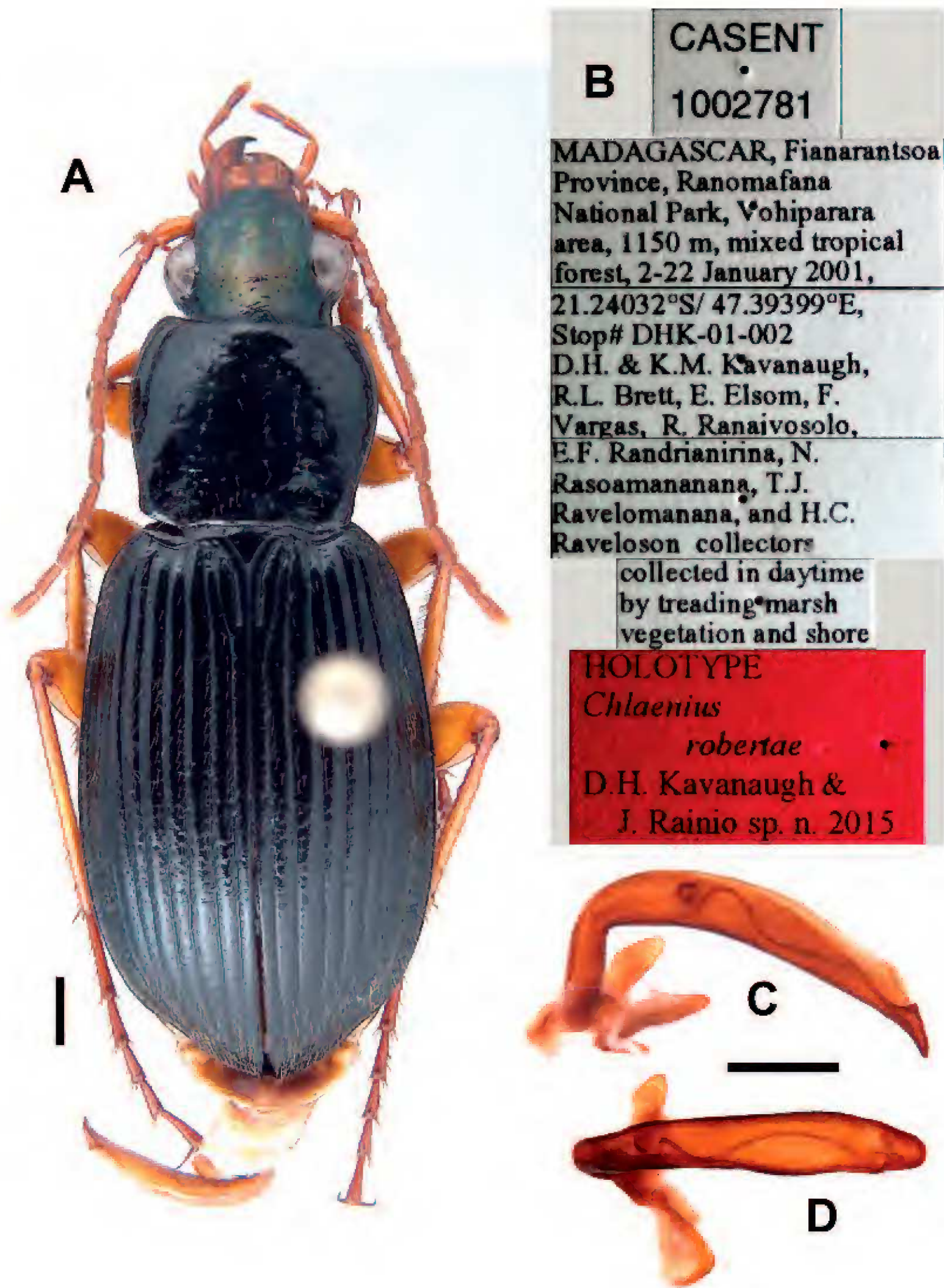


FIGURE 12. Digital images of holotype male of *Chlaenius robertae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C–D. Aedeagus of genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines = 1.0 mm.

derived from the given name of Roberta L. Brett, former graduate student and technical assistant of DHK and one of the collectors of the type series.

RECOGNITION.— Sized moderate for genus, SBL of male = 12.9 mm, of female = 13.3 mm. Members of this species (Fig. 12A) exhibit the following features, which place them in genus *Chlaenites* sensu Jeannel (1949): antennomere 3 longer than antennomere 4; maxillary palpi setose; penultimate labial palpomeres 4 or 5 setose; pronotum with basolateral setae inserted distinctly anterior to the hind angles; elytra with pubescence restricted to near the striae on disk (i.e., not present on the centers of intervals), except more generally and densely present on lateral intervals and near apices; and tarsi asetose dorsally, tarsomeres 5 with two rows of stout setae ventrally. In Jeannel's (1949) key to subgenera of *Chlaenites*, members of this species key to his new subgenus *Chlaenitidius*, which is now considered a junior synonym of subgenus *Amblygenius* Laferrière-Sénectère (1851) (Lorenz 2005), in having the pronotum relatively broad and the setose punctures along the lateral margins of the elytral intervals slightly foveate, especially in the apical half apically. Members of *C. robertae* differ distinctly from those of each of the four species Jeannel included in this subgenus. They differ from members of *Chlaenius cupreolus* Faimaire (1901) in having striae deeply impressed and intervals moderately convex (striae superficial only and intervals flat in *C. cupreolus* members), head with metallic green reflection but pronotum black without a trace of metallic reflection (both head and pronotum with green metallic reflection in *C. cupreolus* members), and elytra without a pale lateral and apical margin (a thin pale margin present in *C. cupreolus* members). They differ from members of *Chlaenius allacteus* Alluaud (1919), which is currently classified in subgenus *Oochlaenius* Alluaud (1933) (Lorenz 2005), in having all elytral intervals similarly and moderately convex (intervals 1, 3, 5 and 7 more convex and intervals 2, 4, 6 and 8 flat in *C. allacteus* members) and, again, elytra without a pale lateral and apical margin (a wide pale margin present in *C. allacteus* members). They differ from members of *Chlaenius inaequalis* Faimaire (1901) in having the pronotum black without metallic reflection (metallic green reflection present on pronotum in *C. inaequalis* members), a longer and narrower elytral form (shorter and broader elytra in *C. inaequalis* members) and elytral epipleurae black (pale in *C. inaequalis* members). Overall, members of *C. robertae* are most similar to those of the fourth species, *Chlaenius lyperus* Jeannel (1949), with which they share similar elytral shape, depth of striae and convexity of intervals. However, they differ from *C. lyperus* members in having a pronotum broader basally than the latter and legs that are pale in color (dark in *C. lyperus* members). Males of *C. robertae* also have genitalia (Figs. 12C–D) that are markedly different in form from those of the other four species (compare with Jeannel's (1949) Fig. 386a–d).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Both specimens of the type series were collected in open habitats at the edges of mixed tropical forest in the Vohiparara area at elevations ranging from 1050 to 1150 m. One was collected in daytime by treading down vegetation at the edge of a marsh, the other was found at night running on bare soil in an abandoned rice paddy.

Tribe Hexagoniini Horn 1881

Genus *Omphreoides* Fairmaire 1896

This genus, precinctive to Madagascar, includes five previously described species. Jeannel (1949) described a new genus, *Stenomphreoides*, for *Omphreoides quodi* Alluaud (1910), but this generic name is now considered just a junior synonym of *Omphreoides* (Lorenz 2005).

***Omphreoides ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figure 13

TYPE MATERIAL.— Holotype (Figs. 13A–B), a female, in NMNH, labeled: “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 900 m 17-22 February 1990 W. E. Steiner”/ “at black light in montane rainforest near river and stream”/ “HOLOTYPE *Omphreoides ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size larger than average for genus, SBL = 13.4 mm. The unique holotype female of *O. ranomafanae* (Fig. 13A) is clearly unlike members of any described species of *Omphreoides*, with several features intermediate between the four typical species and *O. quodi*. The head of the holotype (Fig. 13C) is longer and more slender than that of females of any other species except *O. quodi*, which has an even longer and narrower head (see Jeannel 1949, Fig. 364). In *O. ranomafanae*, the tempora are straight, parallel in anterior their two-thirds, slightly more than twice as long as the diameter of eye, distinctly delimited posteriorly by narrowly round angles. The dorsal longitudinal grooves typical of all members of this genus, except those of *Omphreoides bispinus* Fairmaire (1896), are extended as sharply-defined grooves only about halfway from the point of insertion of the anterior supraorbital setae to that of posterior supraorbital setae and not continued on to base of the head as they are in *Omphreoides bucculentus* Alluaud (1899a) and *Omphreoides distinctus* Alluaud (1936). Posterior to the sharply-defined segments, broad and shallow depressions extend posteriorly, arcuately convergent and nearly joined in the midline near the back of the head. The pronotum (Fig. 13C) is subquadrate, longer than wide (ratio PW/PL = 0.75), with a wavy diagonal row of sparse, coarse punctures (seen also in *O. distinctus* and *O. quodi* members but absent from those of *O. bucculentus* and *O. bispinus*) extended from near the anterior transverse impression paramedially to the basal foveae posteriorly; lateral pronotal margins with short but distinct sinuations anterior to slightly obtuse hind angles; median longitudinal impression deep, wider than in all other *Omphreoides* except *O. quodi* (in which the impression is even wider) and sparsely but coarsely punctate; lateral explanation narrow (narrower at middle than that in *O. bucculentus* members and similar to that in *O. distinctus* member. The elytra are relatively wider than in all other species; each elytron with a straight apical spine in line with interval 3.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected at ultraviolet light in montane rainforest near the junction of the Namorona River and a small tributary stream.

Tribe Perigonini Horn 1881**Genus *Perigona* LaPorte 1835****Subgenus *Ripogena* Jeannel 1941a**

This subgenus includes ten described species, including five from the African mainland and five from Madagascar (Basilewsky 1989). Jeannel (1948) treated this taxon as a separate genus, although he had described it originally as a subgenus of *Perigona* (Jeannel 1941a), and included the four species known to him in a key. Deuve (1998) described a fifth Malagasy species.

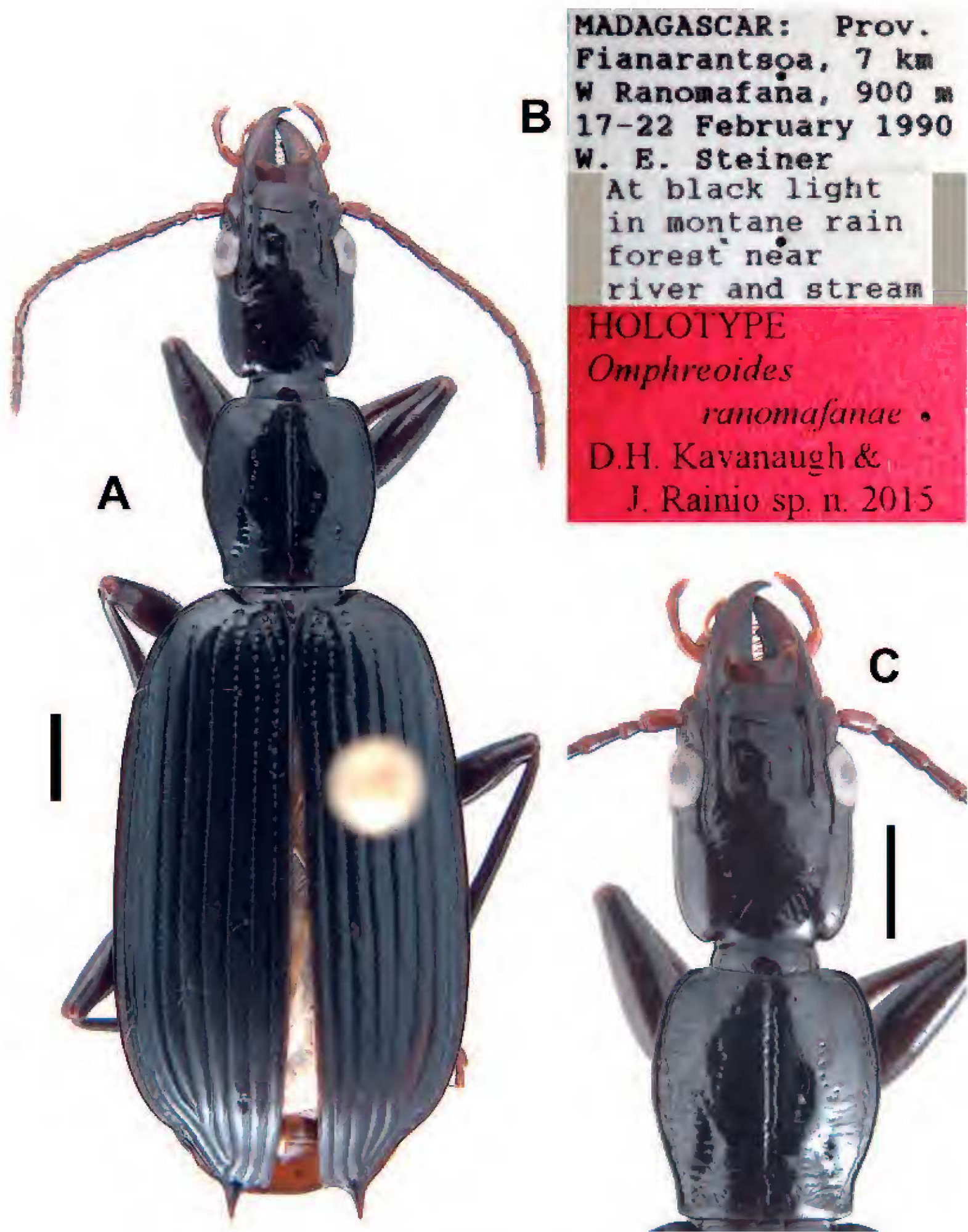


FIGURE 13. Digital images of holotype female of *Omphreoides ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C. Forebody, dorsal aspect. Scale lines A = 1.0 mm, C-D = 0.25 mm

***Perigona (Ripogena) deuvei* Kavanaugh and Rainio, sp. nov.**

Figure 14

Ripogena n. sp. 1; Rainio 2009: 33 (informal designation).*Perigona (Ripogena)* n. sp. 1; Rainio 2012: 73, Rainio 2013: 96 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 14A–B), a male, in CAS, labeled: “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail K at 350 m mark, 24.07.2005”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “HOLOTYPE *Perigona (Ripogena) deuvei* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 4): 1 female (in MNHN) labeled “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail J at 50 m mark, 6.10.2005”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “239.” [handwritten label]; 1 female (in CAS) labeled “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail S at 600 m mark, 9.9.2005”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “239.” [handwritten label]; 1 male (in MZF) labeled “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail S at 600 m mark, 24.7.2005”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “253.” [handwritten label]; 1 female (in MZF) labeled “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail S at 600 m mark, 6.10.2005”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”/ “245.” [handwritten label]. All paratypes also bear the following label: “PARATYPE *Perigona (Ripogena) deuvei* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *deuvei*, is a noun in apposition, derived from the surname of Dr. Thierry Deuve of the Laboratoire d’Entomologie at the Muséum National d’Histoire Naturelle in Paris. We are pleased to name this new species in honor of Dr. Deuve in thanks for his friendship and kind hospitality during our several visits to MNHN in the course of this study.

RECOGNITION.— Size average for subgenus, SBL of males = 3.5–3.8 mm, of females 3.8–3.9 mm. Members of this species (Fig. 14A) share with those of *Perigona heterodera* Alluaud (1936) and *Perigona prasinus* Alluaud (1936) the following features: pronotum with lateral margins without sinuation anterior to hind angles, posterior margin slightly and smoothly convex, and hind angles either obtuse or broadly rounded. These features distinguish members of these three species from those of *Perigona bembidioides* Alluaud (1936) and *Perigona viridimicans* Jeannel (1948), which have distinct sinuation of the lateral margins anterior to rectangular hind angles and a straight basal margin. Members of *P. deuvei* differ from those of *P. prasinus* in having smaller body size (SBL = 4.7 mm in *P. prasinus*), narrower body form, and dorsum without metallic reflection (dorsum with metallic green reflection in *P. prasinus*) but elytra with moderate but distinct iridescence generated by microsculpture comprised of transverse microlines and markedly transverse sculpticells. They are most similar to members of *P. heterodera* in body form and size but differ from them in having the pronotum proportionately longer and male genitalia (Figs. 14C–D) with shaft markedly narrowed basally, markedly inflated in apical two-thirds, and apex longer, slender and ventrally bent in lateral view (Fig. 14C), slightly deflected left and slightly longer in dorsal view (Fig. 14D) than in *P. heterodera* (see Figs. 351b–c in Jeannel 1948). They differ from members of *Perigona descarpentriesi* (Deuve 1998) in having moderately large eyes (eyes markedly reduced eyes in size in *P. descarpentriesi*), pronotum distinctly narrower and with less rounded lateral margins, and elytra with only stria 1 deeply impressed, stria 2 and 3 shallowly impressed but evident on disk, striae 4 to 7 effaced, and stria 8 impressed only in apical one-third (striae 1–7 shallowly impressed but evident at least on disc and stria 8 deeply impressed throughout in *P. descarpentriesi* members). Also, the apex of the median lobe of the male genitalia is narrower in lateral

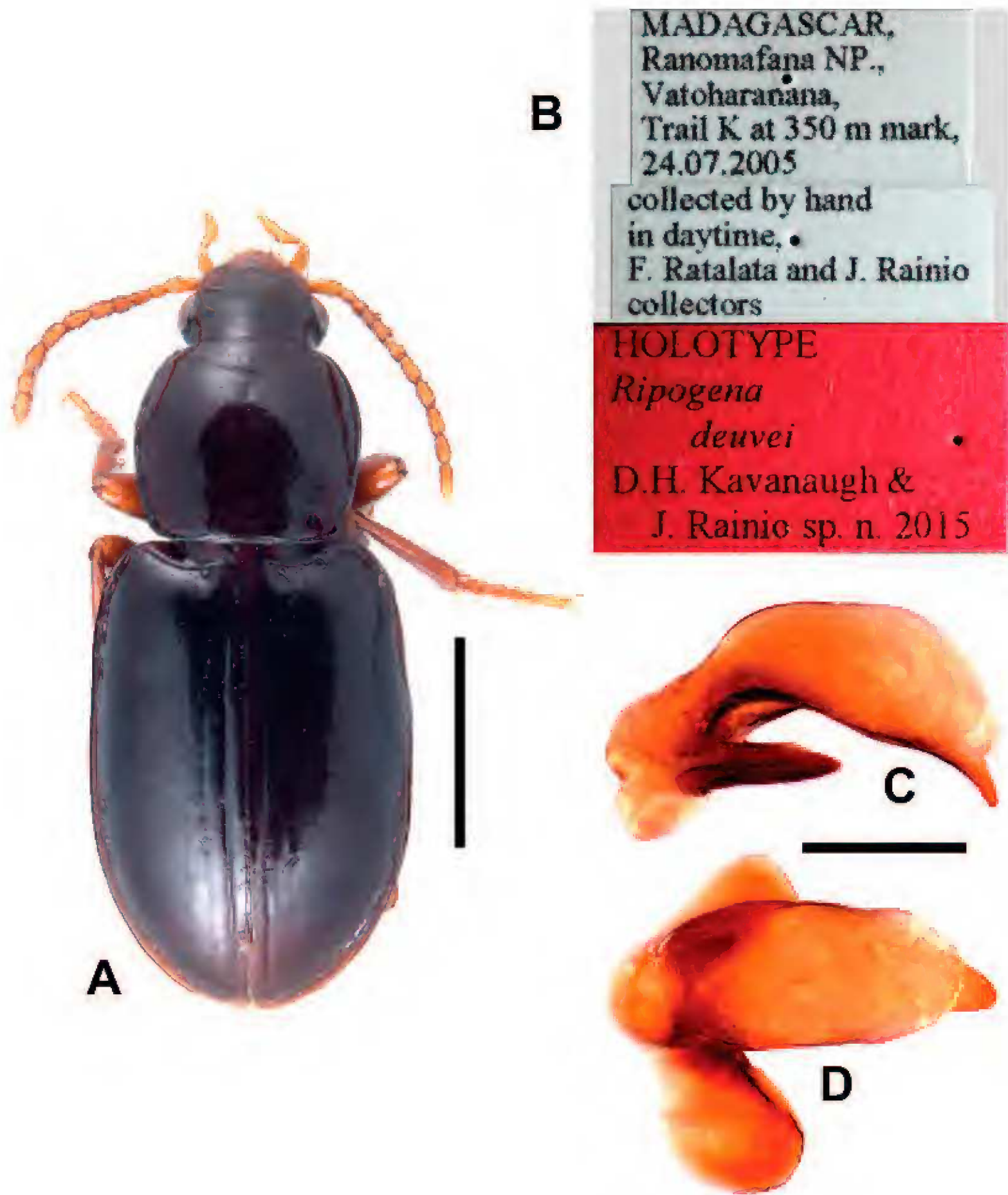


FIGURE 14. Digital images of holotype male of *Perigona* (*Ripogena*) *deuvei* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B Labels; C–D. Aedeagus of genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.25 mm.

aspect in *P. deuvei* males (Fig. 143C) than in those of *P. descarpentriesi* (see Deuve 1998, Fig. 2.). Finally, *P. deuvei* members differ from those of the new species described below in having smaller body size, pronotum with lateral margination very narrow throughout, fewer elytral striae evident, and median lobe of the male genitalia with a longer and ventrally bent apex.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— All specimens of this species were collected by hand in daytime in primary montane rainforest in the Vatoharanana area at an elevation of 1200 m.

***Perigona (Ripogena) ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figure 15

Ripogena n. sp. 2; Rainio 2009: 33 (informal designation).

Perigona (Ripogena) n. sp. 2; Rainio 2012: 73, Rainio 2013: 96 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 15A–B), a male, in CAS, labeled: ““CASENT 1049017”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vatoharanana area, 1050 m, Abotovy stream, 29 April 1998”/ “21°16.7’S 47° 26.1’E, Stop # 98-100, D.H. Kavanaugh collector collected in large rotting log just under loose bark with cavities”/ “HOLOTYPE *Perigona (Ripogena) ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size larger than average for subgenus, SBL = 4.4 mm. The holotype male of this species (Fig. 15A) shares with members of *Perigona heterodera* Alluaud (1936), *Perigona prasinus* Alluaud (1936) and *P. deuvei* sp. nov. the following features: pronotum with lateral margins without sinuation anterior to hind angles, posterior margin slightly and smoothly convex, and hind angles either obtuse or broadly rounded. These features distinguish members of these four species from those of *Perigona bembidioides* Alluaud (1936) and *Perigona viridimicans* Jeannel (1948), which have distinct sinuation of the lateral margins anterior to rectangular hind angles and a straight basal margin. Members of *P. ranomafanae* differ from those of *P. prasinus* in having slightly smaller body size and dorsum without metallic reflection (dorsum with metallic green reflection in *P. prasinus*). They differ from members of *P. heterodera* and *P. deuvei* in having larger body size (SBL = 3.4 mm in *P. heterodera*, 3.5 to 3.9 mm in *P. deuvei*), pronotal hind angles more sharply angulate, lateral explanation of pronotum markedly widened and flattened in region of hind angles (pronotal hind angles rounded or at least less sharply angulate and lateral explanation only slightly wider near hind angles than anteriorly in *P. heterodera* and *P. deuvei*). The unique male holotype of *P. ranomafanae* is slightly teneral and the genitalia are very soft and only lightly sclerotized. However, the apex is sclerotized sufficiently to allow comparisons with those of *P. heterodera* and *P. deuvei* males. In lateral view (Fig. 15C), the apex is slightly longer than in *P. heterodera* males (see Jeannel 1948, Fig. 351b) and distinctly shorter and straighter than in *P. deuvei* males. Finally, they differ from members of *P. descarpentriesi* in having moderately large eyes (eyes markedly reduced eyes in size in *P. descarpentriesi*), pronotum widest anterior to middle and lateral margins nearly straight in posterior half (pronotum widest at middle and lateral margins evenly arcuate throughout *P. descarpentriesi*). Also, the apex of the median lobe of the male genitalia is narrower and more pointed in lateral aspect in *P. ranomafanae* males (Fig. 15C) than in those of *P. descarpentriesi* (see Deuve 1998, Fig. 2.).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected by hand in primary montane

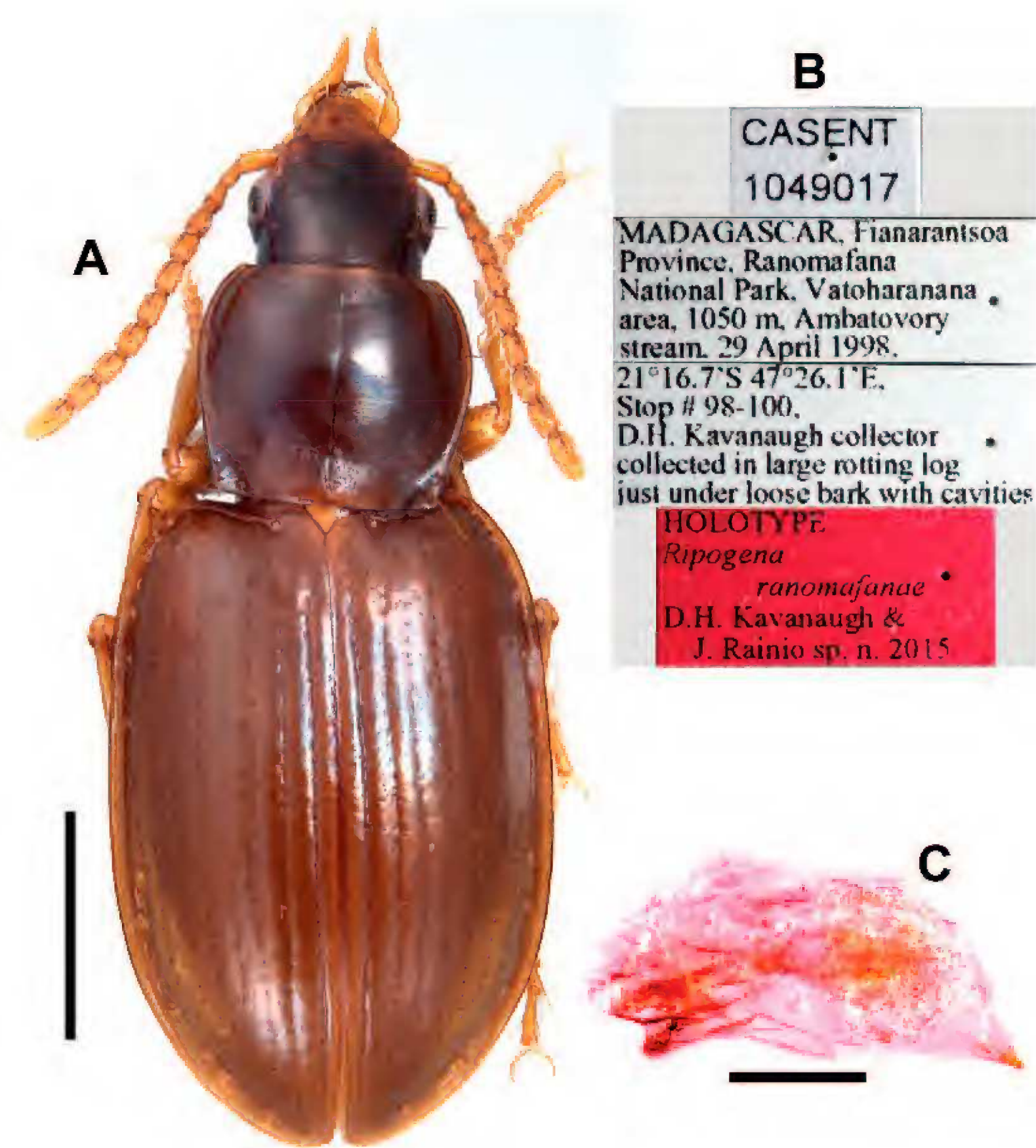


FIGURE 15. Digital images of holotype male of *Perigona* (*Ripogena*) *ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B Labels; C. Aedeagus of genitalia, left lateral aspect [dissection not fully cleaned due to teneral nature of holotype]; D. Dorsal aspect. Scale lines A = 1.0 mm, C = 0.25 mm.

rainforest in the Vatoharanana area at an elevation of 1050 m from under the loose bark of a large log on the forest floor.

Tribe Odacanthini LaPorte 1834

In his treatment of the Malagasy fauna, Jeannel (1948) assigned three species to genus “*Casnonia*” [a misspelling by Latreille and Dejean (1824) of *Cosnania* Dejean 1821], a genus that is now considered to include only Western Hemisphere species. Each of Jeannel’s three “*Casnonia*”

species is now included in a different genus (Lorenz 2005). The species with members most similar to those of the new species described below is now included in *Archicolliuris* Liebke (1931). The present supraspecific classification of odacanthines is basically that of Liebke (1931 and 1938), and no comprehensive taxonomic or phylogenetic treatment of this taxon worldwide has been produced since then. Clearly, a phylogenetic analysis of relationships among and inclusiveness of odacanthine genera is needed. Pending such a study, we tentatively include our new species in genus *Archicolliuris*.

Genus *Archicolliuris* Liebke 1931

Archicolliuris ranomafanae Kavanaugh and Rainio, sp. nov.

Figure 16

TYPE MATERIAL.— Holotype (Figs. 16A–B), a female, in NMNH, labeled: “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 1100m 22–31 October 1988 W. E. Steiner”/ “Flight intercept-yellow pan trap, island in stream, montane rainforest”/ “HOLOTYPE *Archicolliuris ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size large for genus, SBL = 8.2 mm. The holotype female of this species (Fig. 16A) is easily distinguished from members of all other Malagasy odacanthine species based on numerous features. The following features used by Jeannel (1948) in his key to genera are shared with the three species that he included in “*Casnonia*”: integument glabrous (without pubescence), pronotum long, narrow and tubular anteriorly, impunctate, with one or more setae present along each lateral margin. The holotype of *A. ranomafanae* differs from members of *Casnonia fairmairei* Gestro (1895) [currently included in genus *Erectocolliuris* Liebke (1931)] in having a pronotum black in color and with only a single pair of midlateral setae (pronotum rufotestaceous in color and with 5 or 6 pairs of lateral setae present in *E. fairmairei* members). It differs from members *Casnonia coerulans* Künckel d’Herculais (1887) [currently included in genus *Protocolliuris* Liebke (1931)] in having the pronotum only about twice as long as wide (three times as long as wide in *P. coerulans*), the elytra without metallic reflection (elytra with a dark metallic blue reflection), and legs dark black to piceous, except trochanters rufous and basal parts of all femora pale (legs pale in *P. coerulans*, except apical parts of femora dark). It is similar to members of the last of Jeannel’s “*Casnonia*” species, *Colliuris olsoufieffi* Alluaud (1935) [currently included in *Archicolliuris*] in having a shiny black dorsum (with the only pale areas present as elytral pale spots), the pronotum with transverse grooves and ridges in the basal half and anterior angles projected laterally, and the elytra with a deep transverse depression at the basal one-fourth and with three or four discal setiferous pores on elytral interval 3. However, it differs with members of *A. olsoufieffi* in several features: body size larger (SBL = 6.8 mm in *A. olsoufieffi*); pronotum impunctate (coarsely punctate laterally and basally in *A. olsoufieffi*), slightly less than twice as long as wide (2.5 times as long as wide in *A. olsoufieffi*), with lateral borders vaguely present but only as very faintly impressed lines (lateral borders absent from *A. olsoufieffi* members); elytra with only one pair of small pale spots, located at apical one-third on interval 4 (both subapical and subbasal pairs of spots present in *A. olsoufieffi*) and with three or four discal setiferous pores also on interval 5 (absent from *A. olsoufieffi* members); and legs dark, except pale at base of femora and on trochanters (legs pale throughout in *A. olsoufieffi*).

In addition, the holotype of *A. ranomafanae* is unique among members of all Malagasy

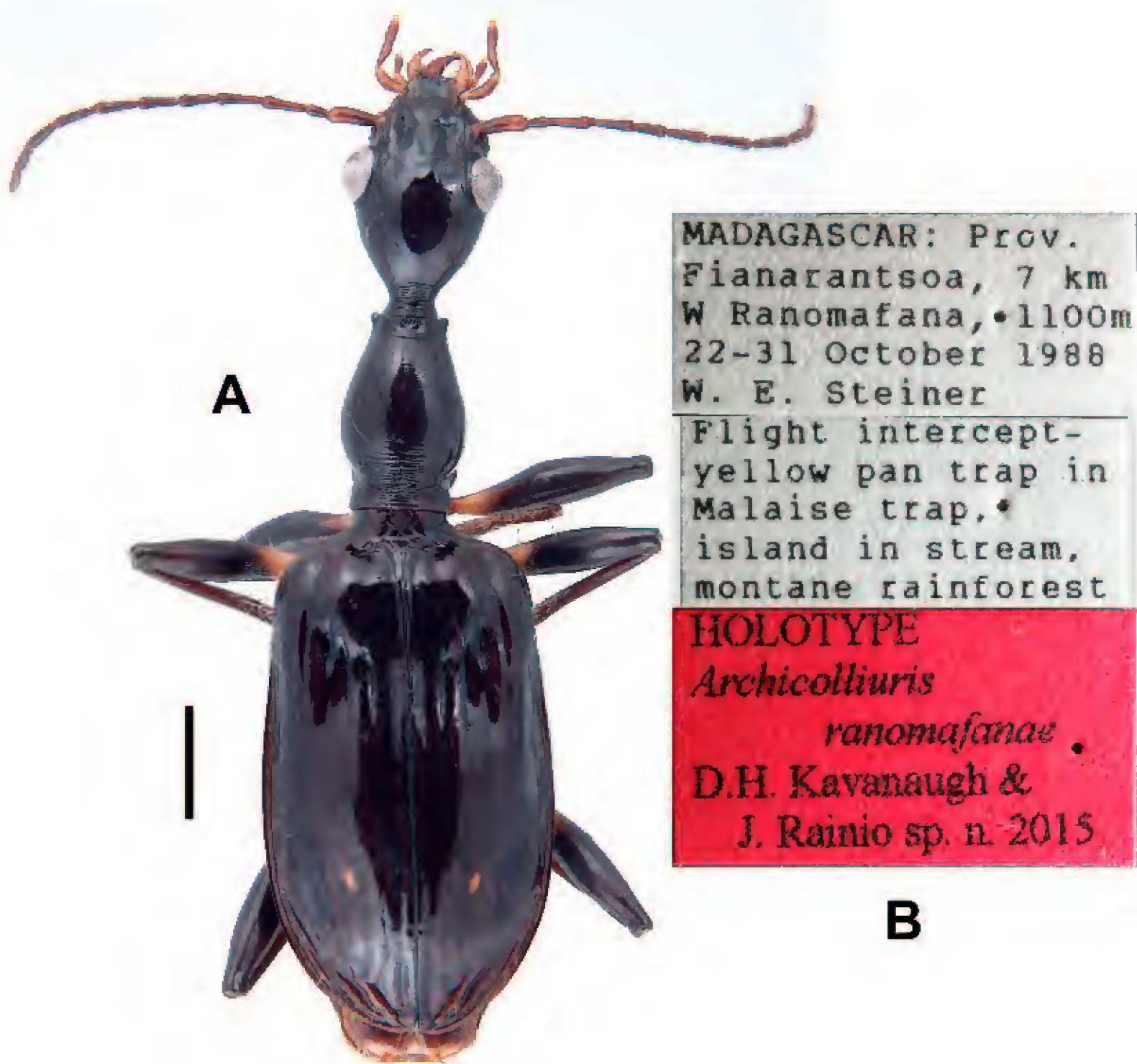


FIGURE 16. Digital images of holotype female of *Archicolliuris ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

odcanthine species in having the elytra distinctly convex throughout, except in the area of the transverse depression, elytral intervals flat, and elytral striae 3 to 7 effaced except in the transverse depression and apically, where they are evident. Striae 1 and 2 are very shallowly impressed but evident (stria 2 less so) in and posterior to the transverse depression. The form and location of the transverse depression of the elytra and the nearly effaced striae are similar to these features of members and genus *Mimocolliuris* Liebke (1933) of the eastern Palearctic and Oriental Regions.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected in a flight intercept-yellow pan trap on an island in a stream in montane rainforest at an elevation of 1100 m.

Tribe Lebiini Bonelli 1810
Subtribe Pericalina Hope 1838
Genus *Thysanotus* Chaudoir 1848

Jeannel (1949) recognized 14 species in this genus precinctive Malagasy genus. Deuve (2010) described six additional new species and returned two species treated by Jeannel as junior synonyms to full species status. He also provided an excellent key to all the known species.

Thysanotus bimaculatoides Kavanaugh and Rainio, sp. nov.
Figures 17–18

TYPE MATERIAL.— Holotype (Figs.16A–B), a male, in CAS, labeled: “MADAGASCAR Ranomafana NP. Mangevo plot 1600m 20.4.2005”/ “240” [handwritten label]/ “HOLOTYPE

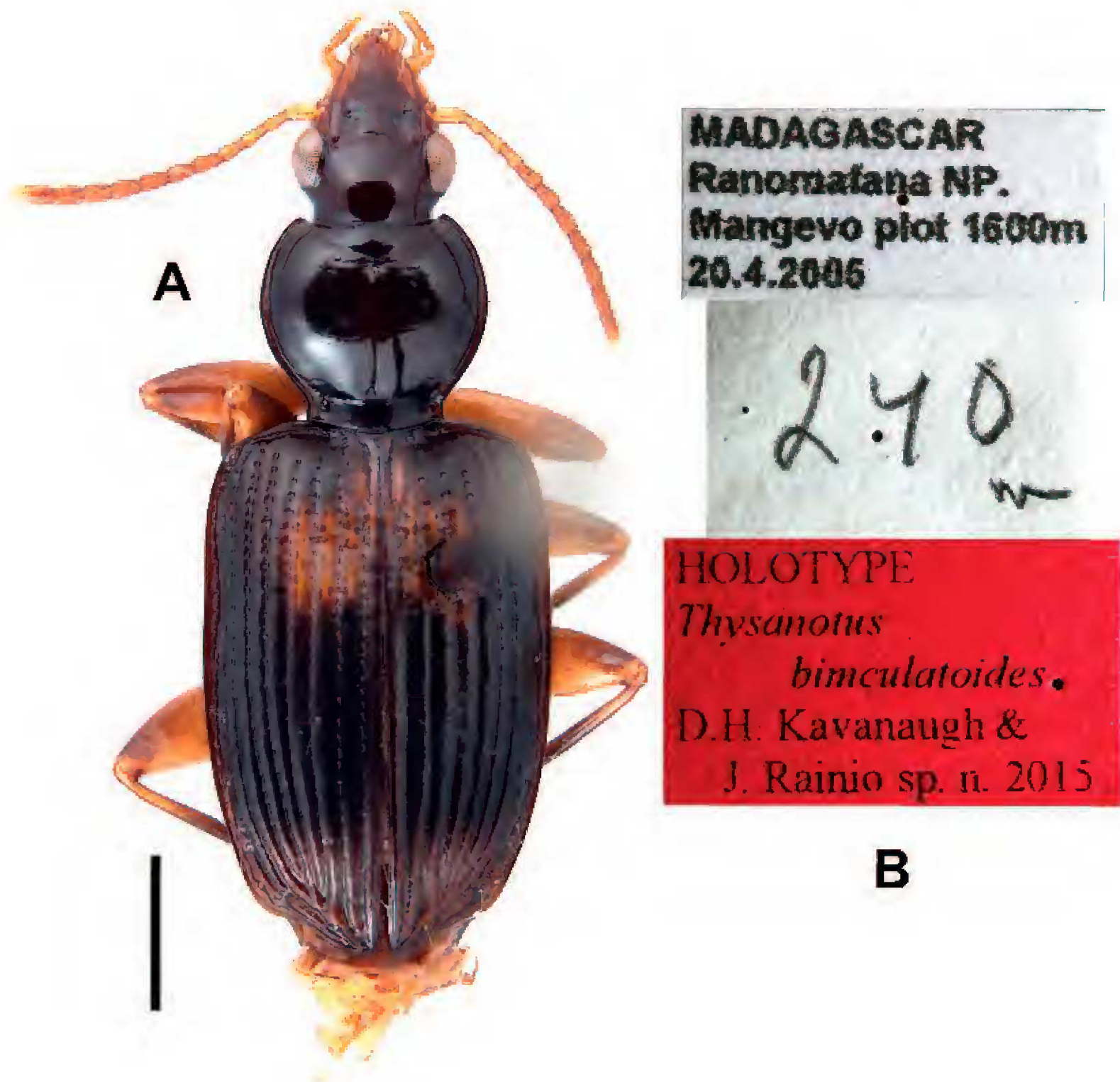


FIGURE 17. A-D. Digital images of holotype male of *Thysanotus bimaculatoides* Kavanaugh & Rainio sp. nov. A–D. A Habitus, Dorsal aspect; B. Labels. Scale line = 1.0 mm.

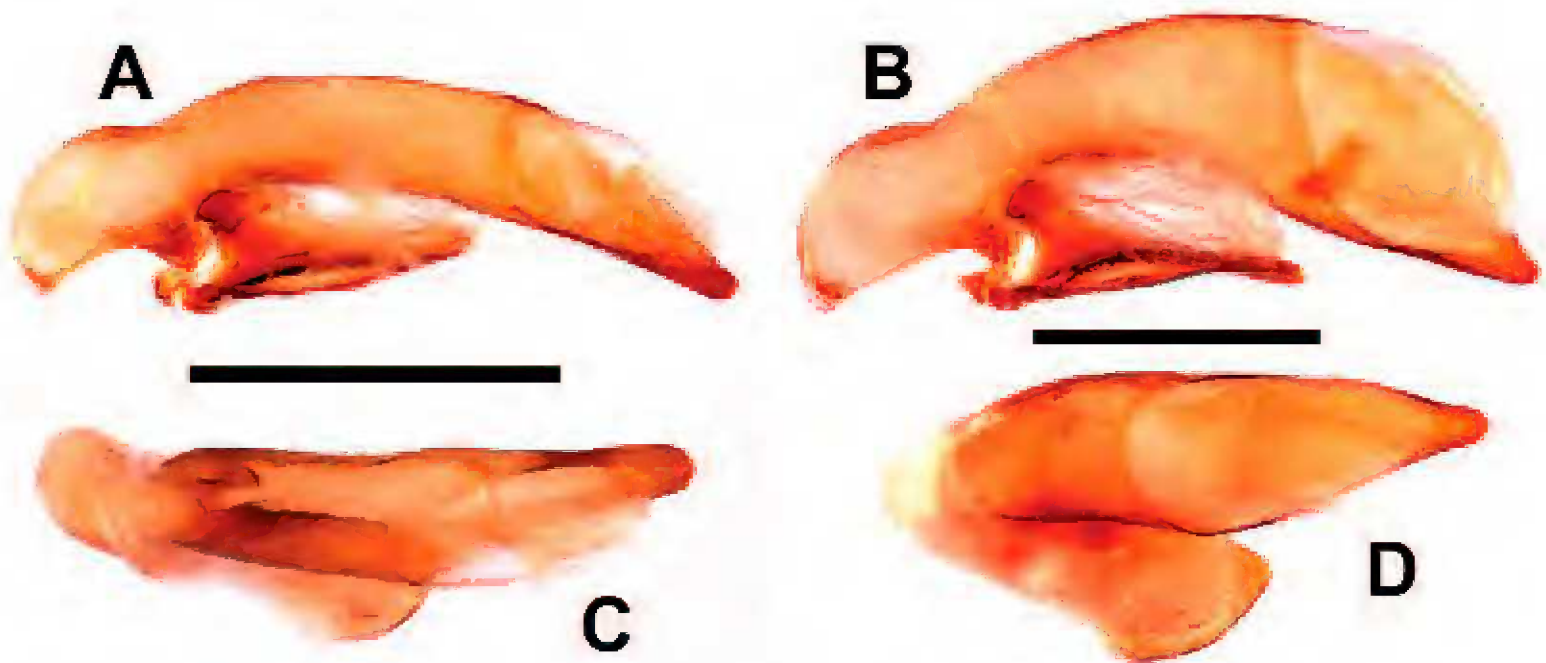


FIGURE 18. Digital images of aedeagus of male genitalia. A, C. Left lateral aspect; B, D. Dorsal aspect. A–B. Holotype male of *Thysanotus bimaculatoides* Kavanaugh & Rainio sp. nov.; B, D. *Thysanotus spinosus* Alluaud (from Ranomafana National Park). Scale lines = 0.5 mm.

Thysanotus bimaculatoides Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 2): 1 female (in MNHN) labeled “MADAGASCAR Ranomafana NP. Mangevo plot 1600m 22.4.2005”/ “240” [handwritten label]; 1 female (in CAS) labeled “CASENT 8069538”/ “MADAGASCAR: Province Fianarantsoa, Forêt d’Ambalagoavy Nord, Ikonga, Abatombé Nov-2000”/ “21°49’39”S, 47°20’20”E Calif. Acad. of Sciences colls: R. Harin’Hala & M.E. Irwin, malaise trap 625m MA-01-12-01”. Both paratypes also bear the following label: “PARATYPE *Thysanotus bimaculatoides* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *bimaculatoides*, is an adjective derived from the Latin words, *bis*, meaning two, and *macula*, meaning spot or spotted, and the Greek word *eidos*, meaning like. The name refers to the similarity between members of this species and those of *Thysanotus bimaculatus* Deuve (2010).

RECOGNITION.— Size slightly less than average for genus, SBL of male = 5.7 mm, of females = 5.3 mm. Members of this species (Fig. 17A) key to *Thysanotus bimaculatus* Deuve (2010) in Deuve’s key based on the following combination of features: elytra shiny, intervals smooth, elytral microsculpture indistinct (comprised of faintly impressed microlines and markedly transverse sculpticells, each elytron with a large, pale macula near the base on intervals 2 to 4, also extended partially onto interval 1 and to scutellum at basomedial part of macula, elytral apex bluntly rounded, not toothed. Members of *T. bimaculatoides* differ from the holotype of *T. bimaculatus* in having slightly larger body size (SBL of holotype female of *T. bimaculatus* = 4.9 mm), pronotum slightly narrower, ratio of PW/PL = 1.1 (ratio of PW/PL = 1.2 in *T. bimaculatus*), narrower basally with subbasal sinuation of the lateral margin slightly longer and deeper and hind angles sharper, rectangular to distinctly acute (compare with Deuve 2010, Fig. 17). Deuve did not have a male specimen of *T. bimaculatus*, so we cannot compare male genitalia of these two species. However, for future comparative purposes, we provide digital photographs of the genitalia (Figs. 18A,C) of the holotype of *T. bimaculatoides* as well as those of a male of *Thysanotus spinosus* (Alluaud 1936c) (Figs. 18B,D) [males of this species previously unknown], to complement the illustrations of other *Thysanotus* species provided by Jeannel (1949) and Deuve (2010).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from two localities, 52 km apart, in central Fianarantsoa Province. Both localities are on the eastern slope off the central plateau.

HABITAT DISTRIBUTION.— The holotype and one paratype were collected by hand in the Mangevo area, about 1600 m distance in from the edge of montane rainforest, at an elevation of 1600 m. The other paratype was collected in a malaise trap in montane rainforest at an elevation of 650 m.

***Thysanotus spinosus* Alluaud 1936**

This species was described on the basis of a single female specimen (holotype in MNHN). Neither Jeannel (1949) nor Deuve (2010) has a male specimen of this species available for study. We take this opportunity to provide digital photographs of the median lobe of the genitalia (Figs. 18B,D) from a male collected in RNP to complement the illustrations of other *Thysanotus* species provided by Jeannel (1949) and Deuve (2010).

Genus *Madecassina* Jeannel 1949

Jeannel (1949) recognized a total of ten species and one additional subspecies in this preinctive Malagasy genus and provided a key for identification of adults. No additional species have been described since Jeannel's study.

***Madecassina bimaculata* Kavanaugh and Rainio, sp. nov.**

Figure 19

TYPE MATERIAL.— Holotype (Figs. 19A–B), a male, in CAS, labeled: “CASENT 1049022”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 13 April 1998, 21°14.9'S 47°25.6'E,”/ “Stop # 98-29, D. H. Kavanaugh collector collected by beating suspended clusters of dead leaves and twigs”/ “HOLOTYPE *Madecassina bimaculata* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 16): 1 female (in CAS) labeled “CASENT 1004001”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamanana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by beating live understory vegetation and/or dead leaves and other suspended debris”; 1 female (in CAS) labeled “CASENT 1049023”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, Trail FF, 21°14.9'S 47°25.6'E,”/ “10-16 November 1998, beaten from vines, V. F. Lee & K. J. Ribardo collector”; 1 male (in CAS) labeled “CASENT 1049024”/ “MADAGASCAR, Fianarantsoa Province, Parc National Ranomafana, Talatakely area, 900 m, mixed tropical forest, 24 April 1998,”/ “21°15.3'S 47°25.9'E,”/ “Stop # 98-76, D. H. Kavanaugh collector collected at night on standing tree trunk”; 1 male (in CAS) labeled “CASENT 8068817”/ “MADAGASCAR: Province Fianarantsoa, Ranomafana National Park, radio tower at forest edge, elev 1130 m 9-20 March 2003”/ “21°15.05'S, 47°24.43'E collector: R. Harin'Hala California Academy of Sciences malaise, mixed tropical forest MA-02-09B-55”; 1 male (in CAS) labeled “CASENT 1049026”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1150 m, mixed tropical forest, 18 April 1998, 21°12.8'S 47°23.0'E,”/ “Stop# 98-52, D. H. Kavanaugh collector collected by beating live vegetation and suspended dead leaves and twigs”; 1 female (in CAS) labeled “CASENT 1049025”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vatoharanana area, 1050 m, Ambatovory stream, 29 April 1998, 21°16.7'S 47°26.1'E,”/ “Stop# 98-101, D. H. Kavanaugh collector collected by beating suspended clusters of dead leaves and

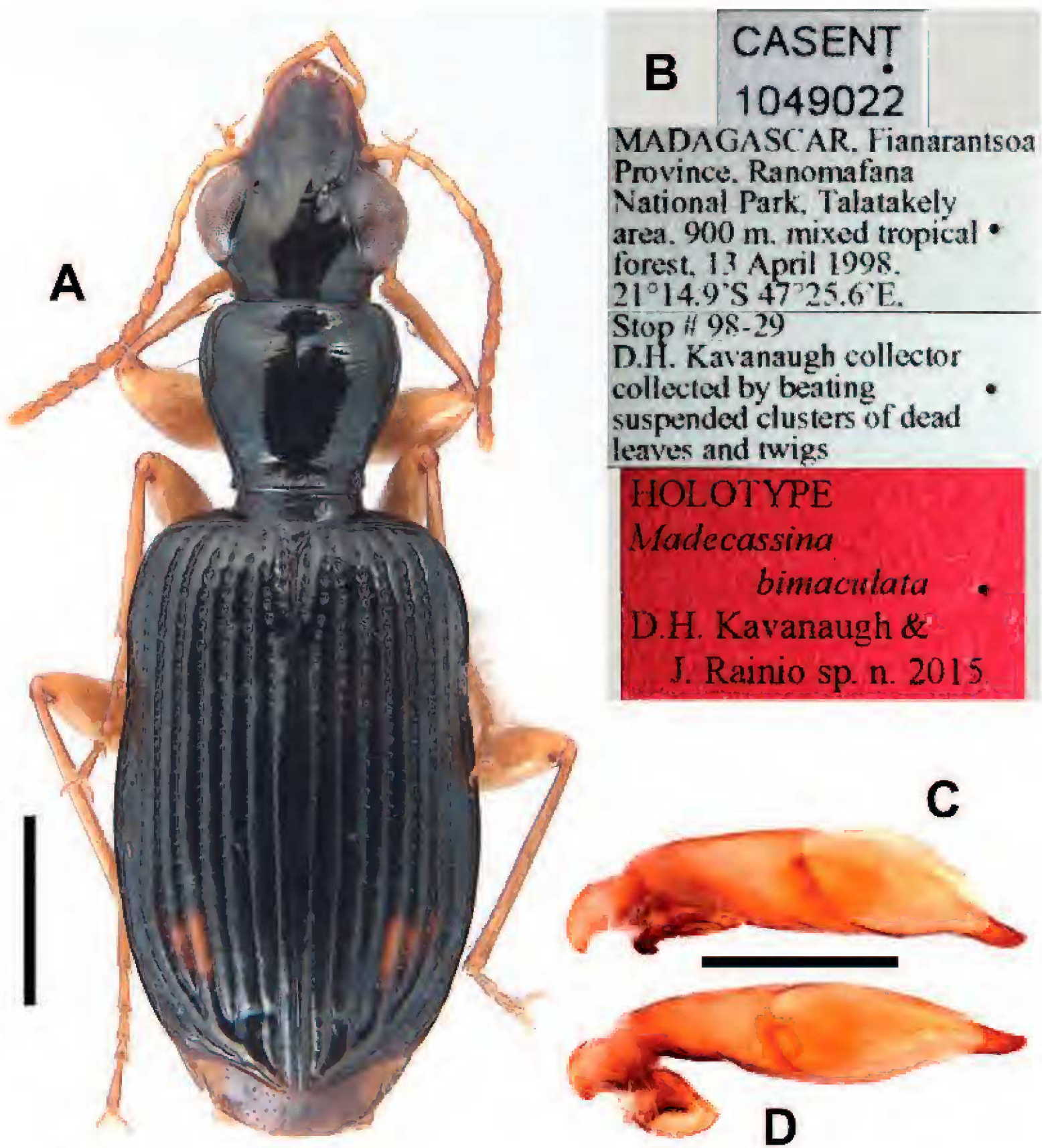


FIGURE 19. Digital images of holotype male of *Madecassina bimaculata* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels C–D. Median lobe of male genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.5 mm.

twigs”; 2 males and 1 female (in CAS and EM) labeled “CASENT 8072308” or “CASENT 8072309” or “CASENT 8072307”, respectively/ “MADAGASCAR: Fianarantsoa Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana elev 1100 m 27-31 March 2003”/ “21°15’24”S, 47°26’00”E California Academy of Sciences coll. Fisher, Griswold et al. beating low veg., montane rainforest code: BLF8401”; 1 male (in MNHN) labeled “MADAGASCAR, Ranomafana NP., Vatoharanana, Trail K at 150 m mark, 25.7.2005”/ “collected by hand in daytime from dead leaves of bushes and trees, F. Ratalata & J. Rainio collectors”; 2 females (in MNHN and MZF) labeled “MADAGASCAR, Ranomafana NP., Talatakely, Trail SP at 50 m mark,

28.07.2005”/ “collected by hand in daytime from dead leaves of bushes and trees, F. Ratalata & J. Rainio collectors”; 2 females (in MNHN and MZF) labeled “MADAGASCAR, Ranomafana NP., Valohoaka, Trail B at 555 m mark, 28.01.2005”/ “collected by hand in daytime from dead leaves of bushes and trees, F. Ratalata & J. Rainio collectors”; and 2 females (in MNHN and MNHN) labeled “MADAGASCAR, Ranomafana NP., Valohoaka, Trail B at 555 m mark, 16.11.2005”/ “collected by hand in daytime from dead leaves of bushes and trees, F. Ratalata & J. Rainio collector”. All paratypes also bear the following label: “PARATYPE *Madecassina bimaculata* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *bimaculata*, is an adjective derived from the Latin words, *bis*, meaning two, and *macula*, meaning spot or spotted. The name refers to the pair of subapical elytral spots seen in members of this species.

RECOGNITION.— Size average for genus, SBL of males = 4.7–5.5 mm, of females = 5.3–5.6 mm. Members of this species (Fig. 19A) key most closely, to *Madecassina picta* Alluaud (1897) in Jeannel’s (1949) key based on the following combination of features: pronotum impunctate, elytra with two subapical pale spots and striae deeply impressed and legs testaceous in color. The only feature used in the key with which *T. bimaculata* members differ is the presence of is metallic reflection on the forebody—members of *T. picta* have evident aeneous or greenish metallic reflection on the head and pronotum, whereas *T. bimaculata* members are without metallic reflection. These two species are otherwise very similar externally; however the pronotum is proportionately slightly longer and more distinctly narrowed basally and the hind angles more sharply defined and rectangular in *T. bimaculata* members than in *T. picta* members (which have the hind angles slightly obtuse). Also, the apex of the median lobe of the male genitalia is shorter, thicker and straighter in lateral aspect (Fig. 19C) and more bluntly triangular in dorsal aspect (Fig. 19D) in *T. bimaculata* males than in those of *T. picta* males, which have the apex longer, narrower and distinctly hooked dorsally in lateral aspect and more narrowly rounded in dorsal aspect (see Jeannel 1949, Figs. 474g and 474i).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Specimens of this species have been collected in primary montane rainforest in the Vatoharanana and Valohoaka areas and in secondary montane rainforest in the Talatakely and Vohiparara areas, at elevations ranging from 900 to 1150 m. They have been collected mainly by beating live vegetation and suspended clusters of dead leaves and twigs.

***Madecassina quadrimaculata* Kavanaugh and Rainio, sp. nov.**

Figure 20

TYPE MATERIAL.— Holotype (Figs. 20A–B), a male, in CAS, labeled: “MADAGASCAR, Ranomafana NP., montane rainforest near Tsinjorano village, 100 m in from forest edge,”/ “21.09637°S 47.52085°E, 1050 m, 19.05.2005, collected by hand in daytime, F.J. Ratelolahy collector”/ “HOLOTYPE *Madecassina quadrimaculata* Kavanaugh & Rainio sp. n. 2015” [red label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *quadrimaculata*, is an adjective derived from the Latin words, *quattuor*, meaning four, and *macula*, meaning spot or spotted. The name refers to the two (subbasal and subapical) pairs of elytral spots seen in members of this species.

RECOGNITION.— Size average for genus, SBL = 5.2 mm. The holotype male of this species (Fig. 20A) keys to *Madecassina maculata* Alluaud (1899b) in Jeannel’s (1949) key based on the following combination of features: body black, forebody without metallic reflection, pronotum

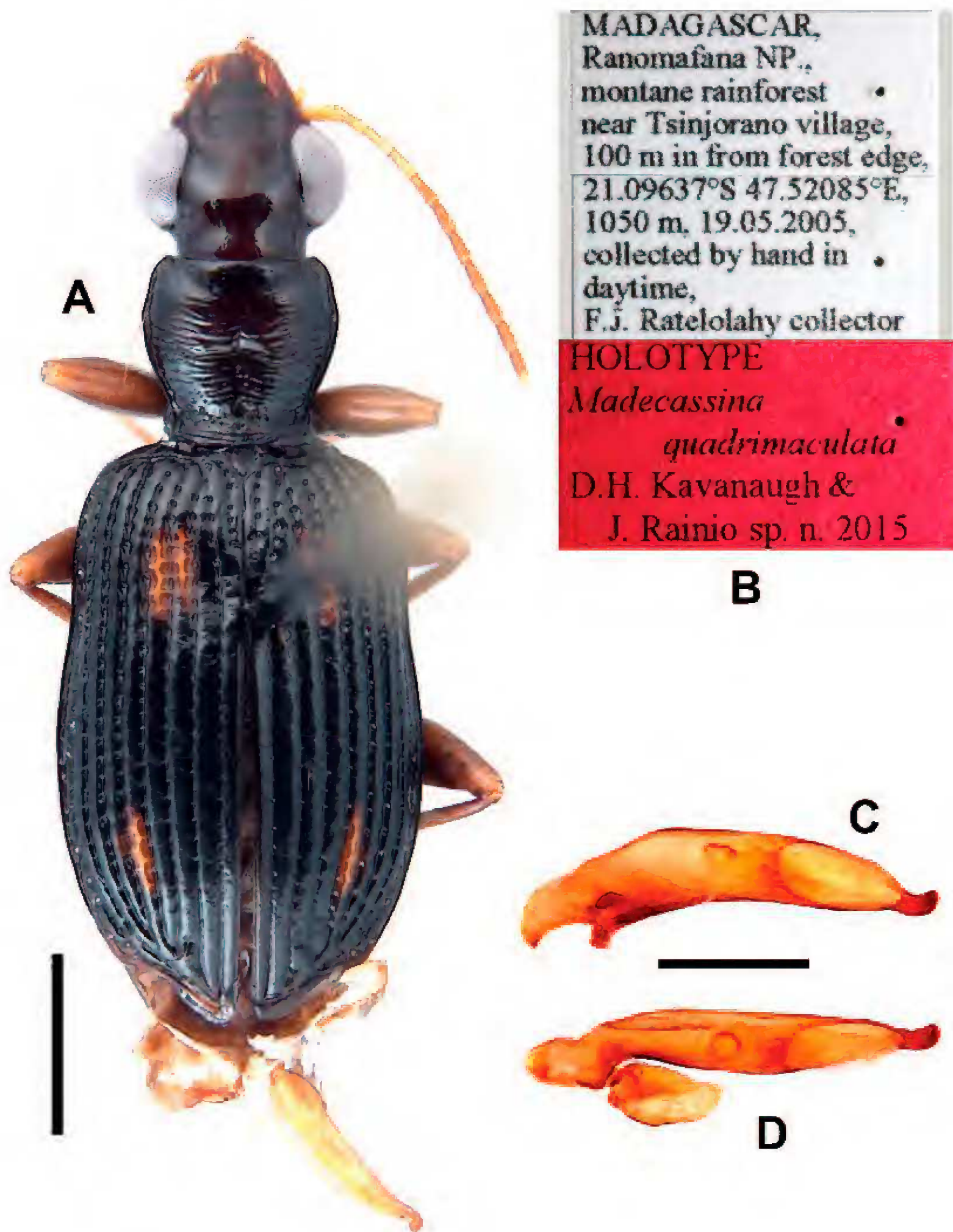


FIGURE 20. Digital images of holotype male of *Madecassina quadrimaculata* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels C–D. Aedeagus of male genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.5 mm.

punctate laterally, and elytra shiny with four pale spots. It differs from members of *M. maculata* in having a smaller body size (SBL = 5.5–6.0 mm in *M. maculata*), the pronotum punctate laterally and laterobasally only, with conspicuous transverse grooves and ridges on disc (in *M. maculata* the pronotum is punctate on the disc also, between the ridges, in contrast to what Jeannel said in his key), elytral intervals shinier due to more shallowly impressed isodiametric microsculpture (elytral intervals duller due to more deeply impressed isodiametric microsculpture in *M. maculata*), the elytral spots much more distinct (much less so in *M. maculata*) and median lobe of male genitalia with apex hooked dorsally and thicker in lateral aspect (Fig. 20C) and slightly swollen and bent right in dorsal aspect (Fig. 20D) (apex hooked but thinner in lateral aspect and more parallel-sided and straight in dorsal aspect in *M. maculata* males) (see Jeannel 1949, Fig. 474f).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The unique holotype was collected in montane rainforest near Tsin-jorano village at a distance of 100 m inside the forest edge at an elevation of 1050 m.

Genus *Pristacrus* Chaudoir 1869

Jeannel (1949) recognized four species in this precinctive Malagasy genus and provided a key for distinguishing their respective members. In this key, Jeannel used two features with which we found problems. First, his statements about pronotal proportions—width in relation to pronotal length (i.e. ratio PW/PL)—appear to have been based on visual impressions only, rather than actual comparative measurements, because our measurements of these proportions in specimens (including types) of the four species have not corresponded to those stated by Jeannel. Unfortunately, this problem renders two of his three couplets (couplets 1 and 3) difficult to interpret. Second, he used shape of the sutural angle of the elytral apex (i.e., whether it is broadly rounded or sharp and toothed) as the primary comparative feature in his couplet 2. In fact, based on the examination of many more specimens than were available to Jeannel, we found that members of all species except one, *Pristacrus laticollis* (Gory and Laporte 1837) have elytral apices that are sharp and toothed, including members of *Pristacrus bonotatus* (Klug 1833), which Jeannel cited as broadly rounded in his key. We point out these problems with Jeannel's key as caution to those trying to use it, as we were, for identifications. No additional species have been described since Jeannel's study.

Pristacrus ranomafanae Kavanaugh and Rainio, sp. nov.

Figures 21–22

Pristacrus n. sp. 1; Rainio 2009: 33, Rainio 2012: 73 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 21A–B), a male, in CAS, labeled: “CASENT 1003833”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2–22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamanana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected at night on surface of rotting logs on forest floor or suspended just above it”/ “HOLOTYPE *Pristacrus ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 19): 1 male and 1 female (in CAS) labelled “CASENT 1003832” or “CASENT 1003831”, respectively, otherwise labeled same as holotype; 1 female (in CAS) labeled “CASENT 1004470”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2–22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L.

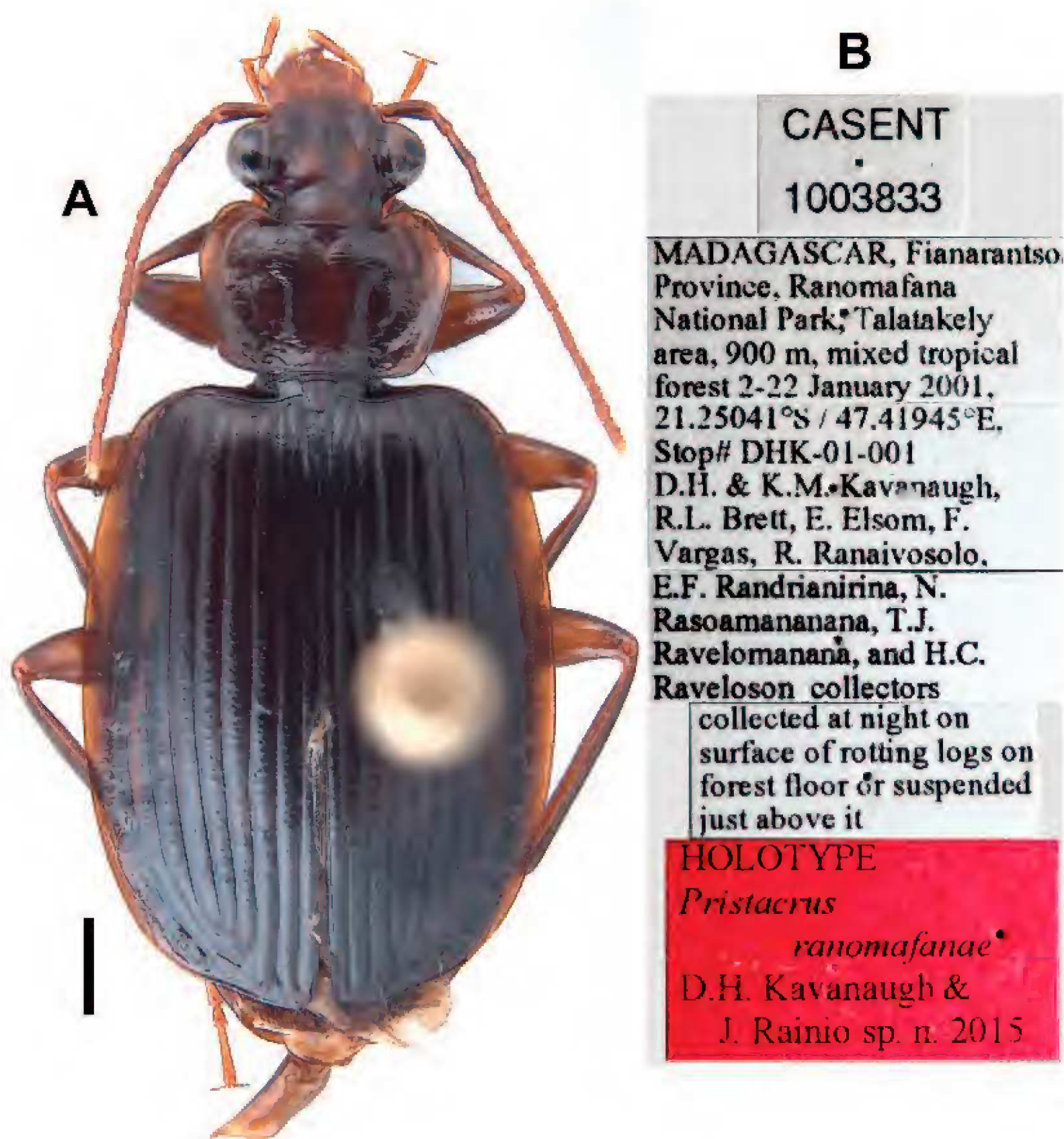


FIGURE 21. Digital images of holotype male of *Pristacrus ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B Labels. Scale line = 1.0 mm.

Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime from large accumulation of dead leaf, twig, and branch debris on and extended up to 2 m above forest floor”; 1 male (in CAS) labeled “CASENT 1002838”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talataakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime under loss bark of rotting log logs on forest floor or sus-

pended just above it”; 1 male and two females (in CAS and MZF) labeled “CASENT 1003752”, “CASENT 1003751” or “CASENT 1003753”, respectively/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime on underside of rotting log logs on forest floor or suspended just above it”; 1 male (in CAS) labeled “CASENT 1004313”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/

“21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime from leaf litter on forest floor”; 1 female (in CAS) labeled “CASENT 1051144”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 27 April 1998”/ “21°15.3’S 47°25.9’E, Stop # 98-85A D.H. Kavanaugh collector collected in and under rotten logs on forest floor”; 1 female (in CAS) labeled “CASENT 8068264”/ “MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Belle Vue at Talatakely, elev 1020 m 28 April – 5 May 2002”/ “21°15.99’S 47°25.21’E collector: R. Harin’Hala California Acad of Sciences malaise secondary tropical forest MA-02-09C-27”; 1 female (in CAS) labeled “CASENT 8068264”/ “MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Belle Vue at Talatakely, elev 1020 m 15-22 November 2001”/ “21°15.99’S 47°25.21’E collector: R. Harin’Hala California Acad of Sciences malaise secondary tropical forest MA-02-09C-03”; 1 male (in NMNH) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 900 m 1-9 February 1990 W. E. Steiner”/ “at black light in montane rainforest near river and stream”; 1 male (in CAS) labeled “CASENT 8005762”/ “21.25041°S/ 47.41945°E MADAGASCAR, Fianarantsoa Prov Ranomafana National Park, Talatakely area, 900m, 10:1:2001 Col. K. Will headlamp search logs”; 5 males and 1 female (in EMEC and MNHN) labeled “CASENT 8005762”/ “21.25041°S/47.41945°E MADAGASCAR, Fianarantsoa Prov Ranomafana National Park, Talatakely area, 900m, 10:1:2001 Col. K. Will headlamp search logs”. All paratypes also bear the following label: “PARATYPE *Pristacrus ranomafanae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size small for genus, SBL of males = 8.3–8.5 mm, of female = 8.6 mm. Members of this species (Fig. 21A) are distinguished from those of all other species in the genus except *Pristacrus binotatus* Klug (1833) by their small body size (SBL greater than 10.0 mm in members of the three other species). They differ from members of *Pristacrus semipiceus* (Fairmaire 1887), in having much smaller body size (SBL = 13.6 to 14.5 mm in *P. semipiceus* mem-

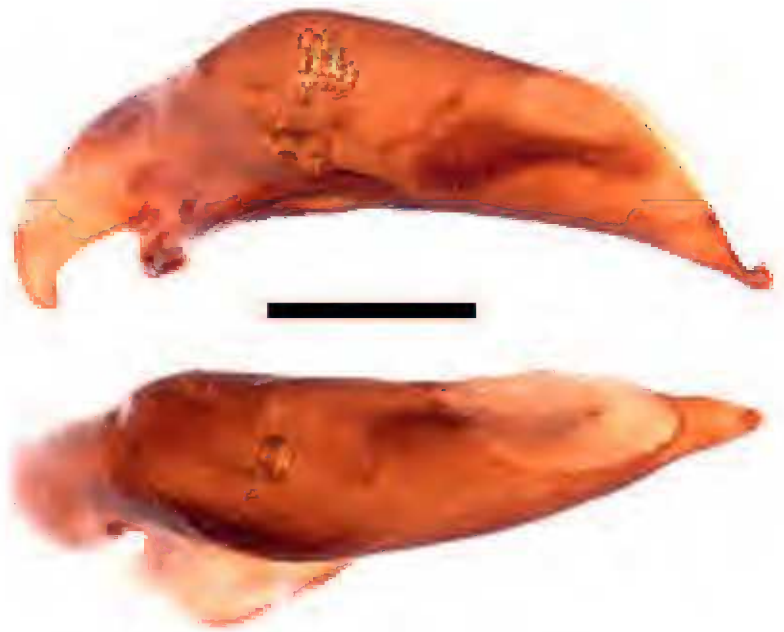


FIGURE 22. Digital images of aedeagus of genitalia of male holotype of *Pristacrus ranomafanae* Kavanaugh & Rainio sp. nov. A. Left lateral aspect; B. Dorsal aspect. Scale line = 0.5 mm.

bers), a shinier dorsal surface, shorter and broadly rounded mandibles and an impunctate (but longitudinally rugulose) frons (dorsal surface duller, mandibles distinctly longer and more tapered, and frons punctate as well as rugulose in *P. semipiceus* members). They differ from members of *P. laticollis* in having slightly smaller body size (SBL = 10.2–11.1 mm), slightly shinier dorsal surface, relatively longer and narrower pronotum and elytra that are broadly ovoid with lateral margin arcuate and lateral explanation broad throughout, especially at middle, and elytral apices distinctly angulate and toothed (duller dorsal surface, relatively broader and shorter pronotum and elytra that are nearly parallel-sided at middle with lateral explanation narrower throughout and elytral apices broadly rounded in *P. laticollis* members). They differ from the unique type of *Pristacrus rotundatus* (Fairmaire 1892) in having smaller body size (SBL = 11.9 mm in *P. rotundatus* type), shinier dorsal surface, elytra less broadly rounded and humeri less anteriorly projected (dorsal surface dull and elytra markedly broad and rounded and humeri more projected anteriorly in *P. rotundatus* type). Members of *P. ranomafanae* are very similar to those of *P. binotatus* in size and overall form. Specimens of the former have the dorsal surface slightly shinier, the pronotum relatively broader basally, with subbasal sinuation of the lateral margins absent or only very faint and hind angles less sharply defined, and elytra with striae slightly more deeply impressed and intervals more convex and more roughened at the raised center than in most members of *P. binotatus*. However, at least a few specimens of *P. binotatus* share one or more of these features with *P. ranomafanae* members. They only features that most reliably distinguish members of *P. ranomafanae* from those of *P. binotatus*, as well as from members of the other species, are the male genitalia. In *P. ranomafanae* males (Fig. 22A–B), the shaft of the median lobe is inflated subbasally but lacks the large, well-defined dorsal bulge seen in males of *P. binotatus* (see Jeannel 1949, Fig. 486) and, in lateral aspect (Fig. 21A), the apex is distinctly hooked dorsally (apex not hooked in *P. binotatus* males. Males of the each of the other species also have the shaft of the median lobe uniquely shaped.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Specimens of the type series were all collected in secondary montane rainforest in the Talatakely area at elevations of 900 to 1020 m. The area is replete with invasive guava (*Psidium cattleianum*). Specimens were found in daytime in masses of dead leaves, twigs and branch debris accumulated on the forest floor, in leaf litter, and under loose bark or on the underside of rotting logs on the forest floor. Several were found at night running on the surfaces of rotting logs on the forest floor; two were collected in malaise traps and one was attracted to and collected at an ultraviolet light.

Genus *Eurydera* Laporte 1831

Jeannel (1949) recognized 24 species plus three additional subspecies in this precinctive Malagasy genus and a provided a key for identification of their members. Mateu (1973) described seven additional species. Type specimens for all of Mateu's species are deposited in MNHN, so we were able to compare our material with reliably determined specimens of all described *Eurydera* species, including the seven not included in Jeannel's key.

Eurydera ocellata Kavanaugh and Rainio, sp. nov.

Figures 23–24

TYPE MATERIAL.— Holotype (Figs. 23A–B), a male, in CAS, labeled: “CASENT 8068800”/ “MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Bellevue at Telatakely, elev 1020 m 12-19 February 2002”/ “21°15.99'S, 47°25.21'E collector: R. Harin'Hala California

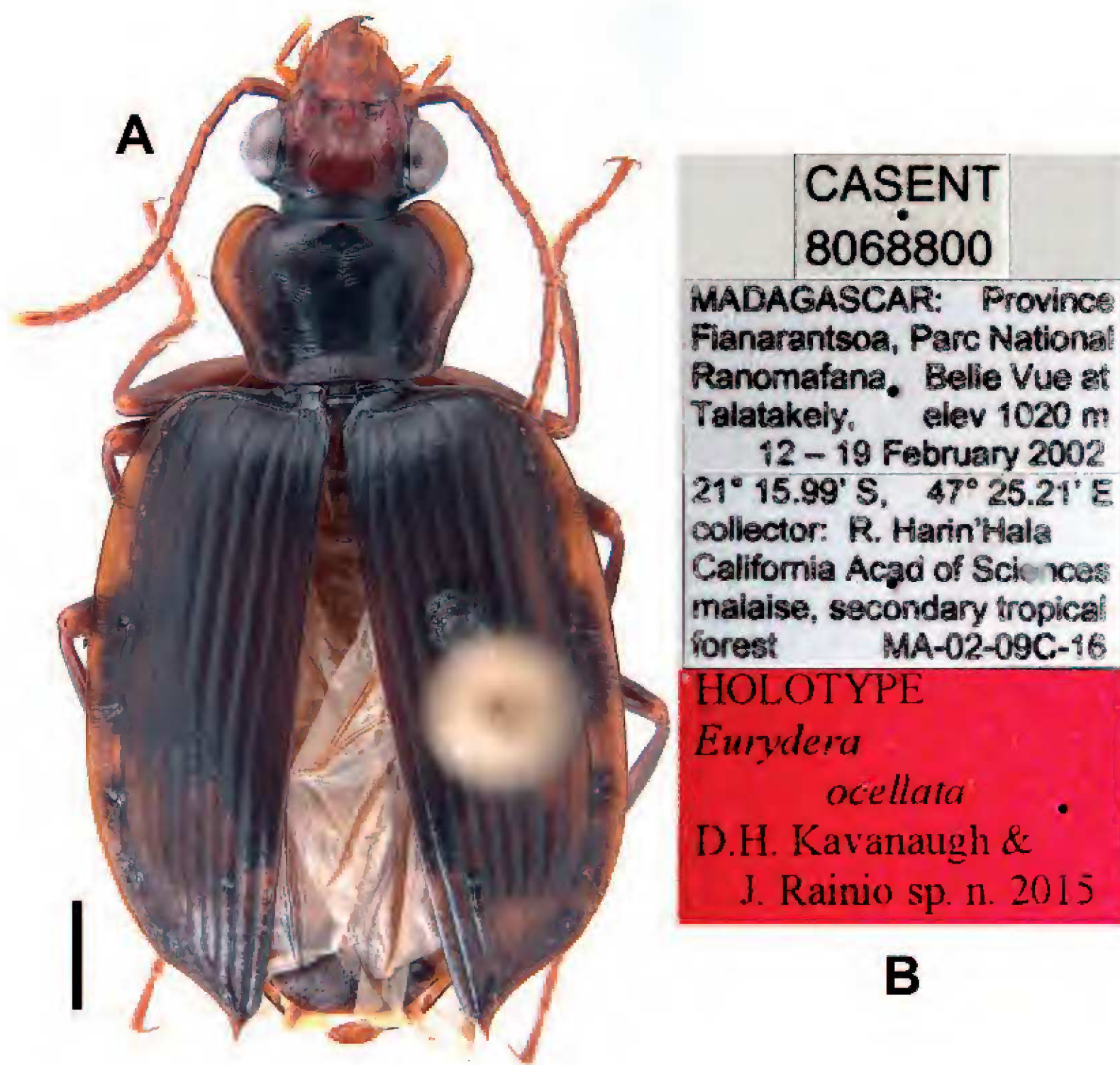


FIGURE 23. Digital images of holotype male of *Eurydera ocellata* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Label. Scale line = 1.0 mm.

Academy of Sciences malaise, secondary tropical forest MA-02-09C-16”/ “HOLOTYPE *Eurydera ocellata* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in NMNH) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 900 m 1-9 February 1990 W. E. Steiner”/ “at black light in montane rainforest near river and stream”/ “PARATYPE *Eurydera ocellata* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ocellata*, is the Latin adjective meaning having little eyes or marked with spots. The name refers to the small, faint dark spot on interval 3 within the subapical pale area of each elytron at the insertion point of the subapical discal setiferous pore.

RECOGNITION.— Size small for genus, SBL of male and female = 9.2 mm. Members of this species (Fig. 23A) key to *Eurydera mormolycoides* Coquerel (1851) in Jeannel’s (1949) key on the



FIGURE 24. Digital images of holotype male of *Eurydera ocellata* Kavanaugh & Rainio sp. nov. A. Head, dorsal aspect; B–C. Aedeagus of male genitalia; B. Left lateral aspect; C. Dorsal aspect. Scale lines = 0.5 mm.

basis of the following combination of features: size small; head (Fig. 24A) with frontal furrows deeply impressed, smooth, divergent posteriorly and without a transverse impression uniting them, posterior part of frons smooth, narrow and triangular, without lateral grooves prolonged posteriorly beyond the posterior border of the eyes; mandibles short and broad, lateral border not broadly explanate, lateral margin only slightly convex; pronotum cordate, distinctly narrowed basally, lateral margins angulate at insertions of midlateral setae; elytra short, round and black, each with a reddish subapical spot tangential to the medial suture as well as subhumeral and subapicolateral reddish areas and reddish apical spines, elytral intervals moderately convex; median lobe of male genitalia without a large, angulate projection on the ventral margin of the shaft near the base. They differ from *E. mormolycoides* members in having: dorsal surface slightly shiny (dull in *E. mormolycoides* members); pronotum with lateral explanations pale testaceous (darker in *E. mormolycoides* members), anterior angles broadly rounded (more narrowly rounded in *E. mormolycoides* members) and lateral margins with shallow but distinct sinuation anterior to hind angles (sinuation absent from or less distinct in *E. mormolycoides* members); elytra with larger but less distinct (less contrasting with rest of elytra) pale subapical macula with black eye spot on interval three (macula extended further laterally and lateroanteriorly than in *E. mormolycoides* members) and apical spine about half as long as spine in *E. mormolycoides* members. Finally, the median lobe of the male genitalia (Figs. 24B–C) has a thicker shaft throughout and an apex shorter and thicker in lateral view (Fig. 24B) and broader and straighter in dorsal view (Fig. 24C) than in *E. mormolycoides* males (see Jeannel 1949, Fig. 492b).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The holotype specimen was collected in a malaise trap in secondary montane rainforest in the Talatakely area at an elevation of 1030 m. The paratype specimen was collected at ultraviolet light in secondary montane rainforest near the junction of the Namorona River and a small tributary stream.

Eurydera oracle Kavanaugh and Rainio, sp. nov.

Figures 25–26

TYPE MATERIAL.— Holotype (Figs.25A–B), a male, in CAS, labeled: “CASENT 8005762”/ “21.25041°S/ 47.41945°E MADAGASCAR, Fianarantsoa Prov Ranomafana National Park, Talatakely area, 900m, 10:1:2001 Col. K. Will headlamp search logs”/ “HOLOTYPE *Eurydera oracle* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 7): 1 male (in NMNH) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 1100 m 1-7 November 1988 W. E. Steiner”; 1 female (in NMNH) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 1100 m 27-31 October 1988 W. E. Steiner”/ “Malaise trap on island in stream, montane rain forest”; 1 female (in EMEC) labeled “CASENT 1003844”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Rav-

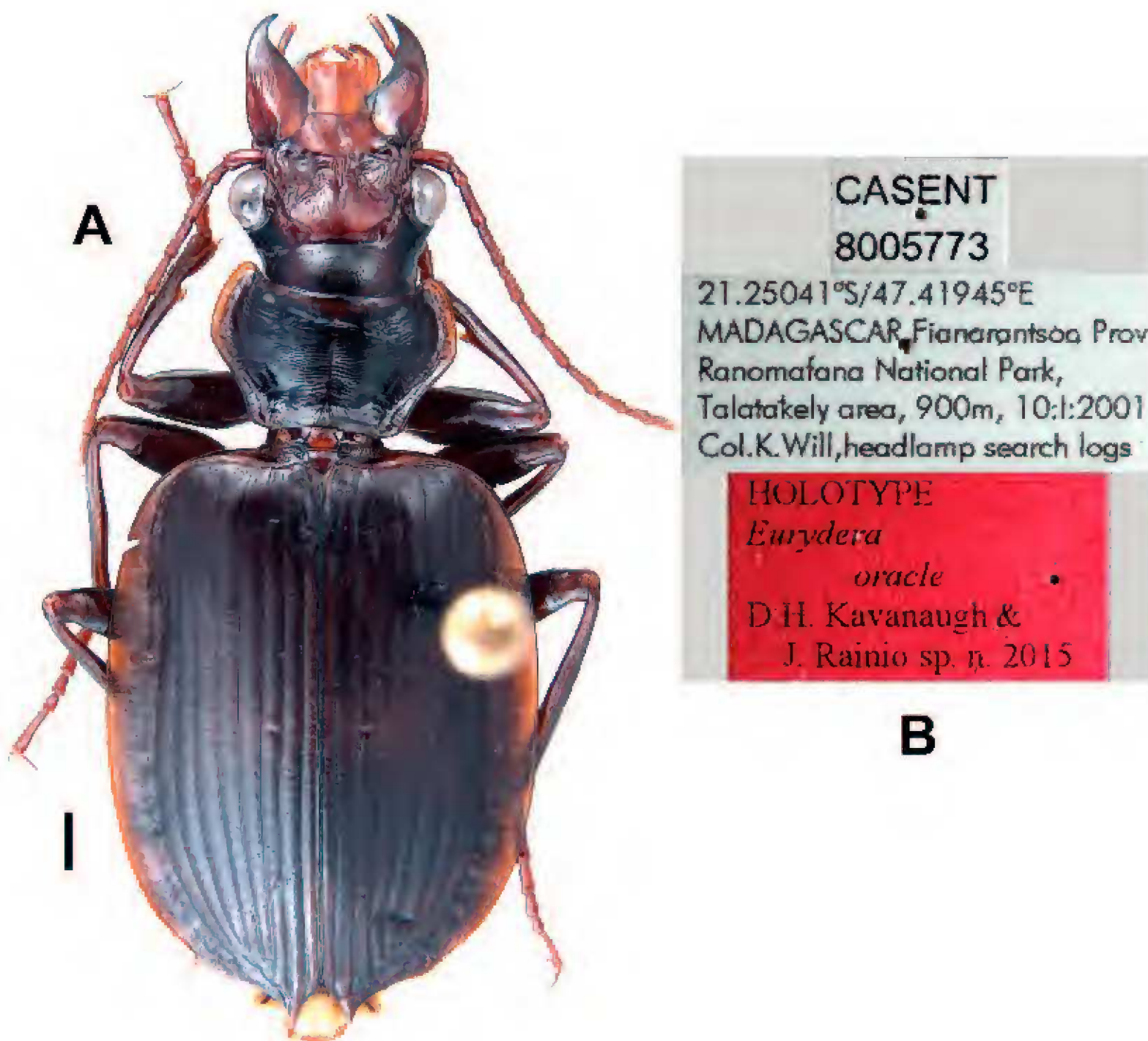


FIGURE 25. Digital images of holotype male of *Eurydera oracle* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Label. Scale line = 1.0 mm.

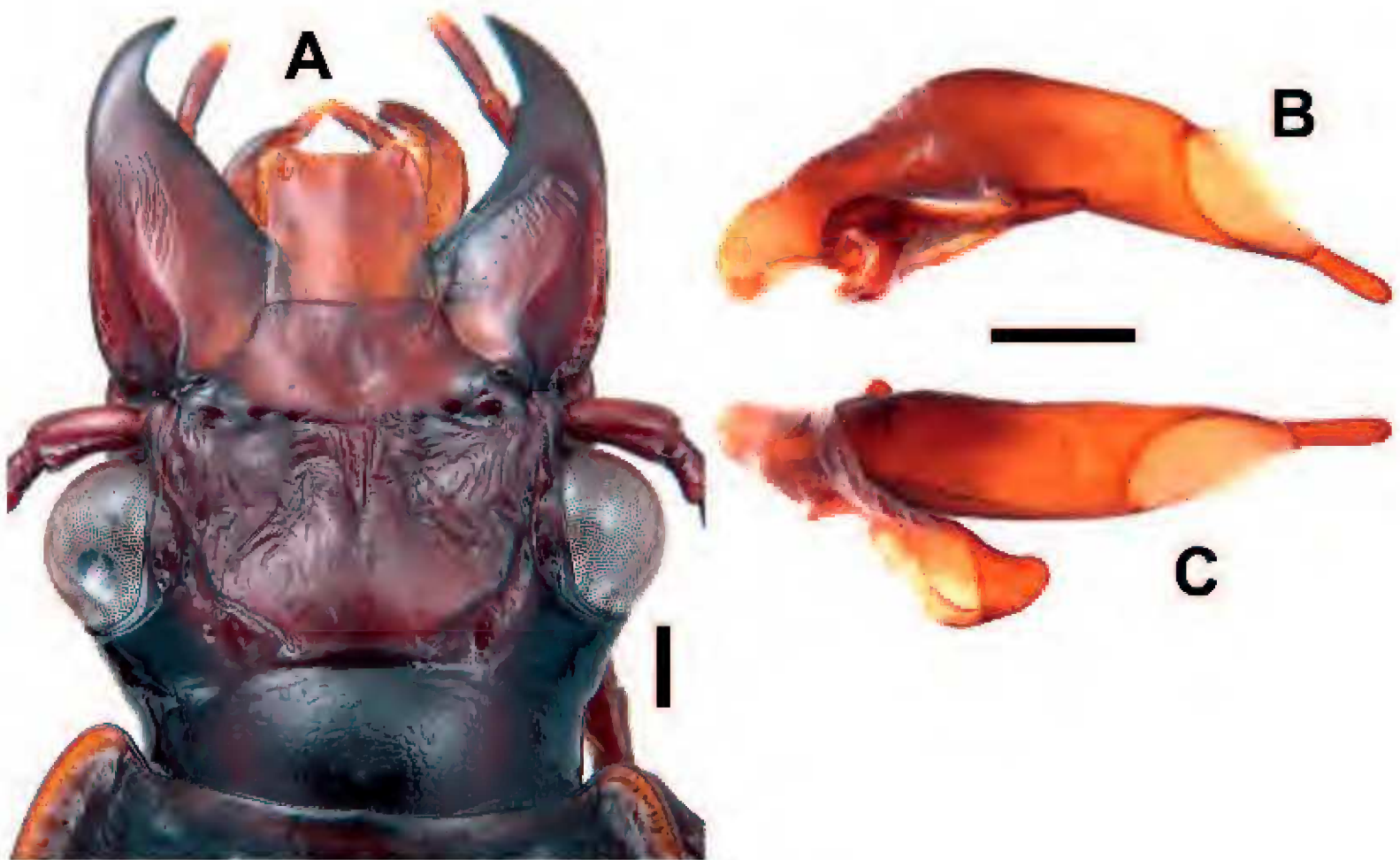


FIGURE 26. Digital images of holotype male of *Eurydera oracle* Kavanaugh & Rainio sp. nov. A. Head, dorsal aspect; B–C. Aedeagus of male genitalia; B. Left lateral aspect; C. Dorsal aspect. Scale lines = 0.5 mm.

elomanana, and H.C. Raveloson collectors”/ “collected at night on underside of shelf fungus on rotting log on forest floor or suspended just above it”; 1 female (in CAS) labeled “CASENT 1003739”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamanana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime on underside of rotting logs on forest floor or suspended just above it”; 1 female (in MNHN) labeled “CASENT 8068234”/ “MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Bellevue at Telatakely, elev 1020 m 10-14 January 2002”/ “21°15.99’S, 47°25.21’E collector: R. Harin’Hala California Academy of Sciences malaise, secondary tropical forest MA-02-09C-11”; 1 female (in MTEC) labeled “MADAGASCAR: Fianaran. Pr. Ranomafana N.P. HQ. area 21°15’24”S 47°25’15E 25NOV1994, at night M.A. Ivie & D.A. Pollack”; and 1 female (in CAS) labeled “CASENT 8068052”/ “MADAGASCAR: Province d’Antsiranana, Montaigne Francais, elev 150 m 6-20 March 2001”/ “12°19.5’S, 49°20’E California Acad. of Sciences R. Harin’Hala coll. Malaise along forested limestone ridge MA-01-06-0. All paratypes also bear the following label: “PARATYPE *Eurydera oracle* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *oracle*, is a noun in apposition and refers to Oracle Corporation, headquartered in Redwood City, California. We are pleased to name this new species for Oracle Corporation in recognition of and thanks for its generous support of the California Academy of Science 1998 Madagascar expedition, which produced many of the specimens on which this study has been based.

RECOGNITION.— Size above average for genus, SBL of males = 13.9–15.3 mm, of females = 12.4–14.1 mm. Members of this species (Fig. 25A) key to the *armata* group in Jeannel’s (1949)

key based on the following combination of features: size medium; head (Fig. 26A) with posterior part of frons formed as a broad, flat, smooth, elevated plateau, reddish in color, laterally delimited by deep furrows extended posteriorly beyond the level of the posterior margin of the eye then medially at a 45° angle and joined posteriorly (but distant from the midline) with a deep transverse furrow across the middle of the head; mandibles moderately short and broad; median lobe of male genitalia without a large, angulate projection on the ventral margin of the shaft near the base. However, within the *armata* group, they cannot be identified to species using Jeannel's key. They differ from members of *Eurydera crispatifrons* (Fairmaire 1896) in having a deep, sharply defined transverse furrow across the back of the head behind the raised frontal plateau (this furrow absent or very shallow and poorly defined in *E. crispatifrons* members). They differ from members of *Eurydera rufotincta* (Fairmaire 1868) in having the head large, nearly as wide as the pronotum (narrower in *E. rufotincta* members), black or piceous legs (rufous in *E. rufotincta* members) and in lacking transverse pale bands on the elytra (present in *E. rufotincta* members) and the deep oblong fossae present on the back of the frons in *E. rufotincta* members.

They differ from *Eurydera armata* Laporte (1831) and *Eurydera latipennis* (Klug 1835) members in having the lateral furrows on the back of the head angularly convergent toward the posterior transverse furrow whereas these furrows are virtually parallel posteriorly in *E. armata* members or very slightly convergent posteriorly in *E. latipennis* members and joined with the transverse furrow more laterally in members of both species. Also, the posterior part of the frontal plateau is much more elevated in *E. oracle* males than in those of these other two species as well as males of *Eurydera cuspidata* (Klug 1835), *Eurydera ornatipennis* (Fairmaire 1897), *Eurydera sulcicollis* Mateu (1973) and *Eurydera ambreana* Mateu (1973). Most members of *E. armata* and *E. ornatipennis* have pale bands or spots on the elytra, although some specimens lack all pale markings. None of the specimens of *E. oracle* that we have examined have similar pale markings, although several of our specimens have the apical one-fifth of elytral interval 1 narrowly pale, and two specimens also have interval 2 more dimly pale in the same area. Overall, members of *E. oracle* are most similar to those of *E. sulcicollis*, but they differ from the latter in having greater sexual dimorphism, with *E. oracle* males having relatively larger heads, more prominent eyes, frons more wrinkled and with the posterior portion of the medial area more elevated, the transverse groove deeper, and the pronotum shorter and distinctly wider than in *E. sulcicollis* male. Females of these two species are very similar. Finally, the median lobe of the genitalia of *E. oracle* males (Fig. 26B–C) is distinct from that of males all other species in the genus (compare with Jeannel 1949, Figs. 489, 491–498, 500, and Mateu 1973, Figs. 1–8) in the combined forms of the shaft and apex.

GEOGRAPHICAL DISTRIBUTION.— We have examined specimens from only two areas. Seven specimens were collected in Ranomafana National Park, the type locality, on the eastern slope off the central plateau in the northeastern part of the southern half of the island of Madagascar. The eighth specimen, a female, was collected at Montagne des Français, in Antsiranana Province, at the northern end of the island and just over 1000 km distant from Ranomafana. No specimens have been recorded from intervening areas

HABITAT DISTRIBUTION.— The specimen from Montagne des Français was collected in a malaise trap set on a forest limestone ridge at an elevation of only 150 m. All of the specimens from Ranomafana National Park were collected in secondary montane rainforest in the Talatakely area at elevations ranging from 900 to 1100 m. They have been collecting using malaise traps or by hand. In daytime, they have been found hiding on the underside of logs on the forest floor; and at night they have been found on the underside of shelf fungi on rotting logs and stumps.

Eurydera simplica Kavanaugh and Rainio, sp. nov.

Figures 27–28

Eurydera sp.; Rainio and Niemelä 2006: 227 (informal designation).

Eurydera n. sp. 3; Rainio 2009: 31, Rainio 2012: 72 (informal designation).

TYPE MATERIAL.— Holotype (Figs.27A–B), a male, in CAS, labeled: “MADAGASCAR, Ranomafana NP., Talatakely, 900 m, Trail SP at 50 m mark, 08.03.2004”/ “collected by hand in daytime in secondary montane rainforest, F. Ratalata & J. Rainio collectors”/ “106” [handwritten label]/ “HOLOTYPE *Eurydera simplica* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes

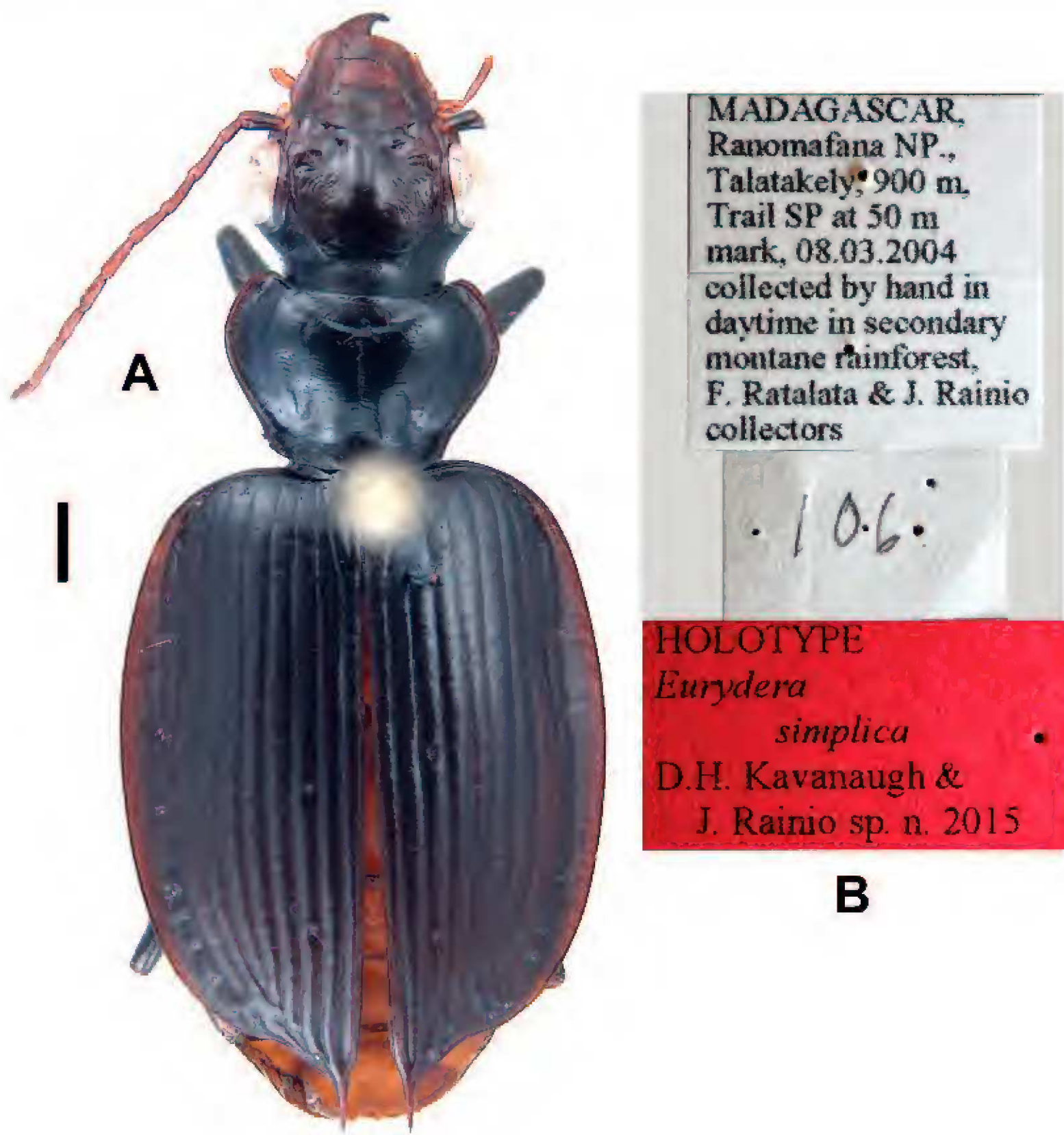


FIGURE 27. Digital images of holotype male of *Eurydera simplica* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

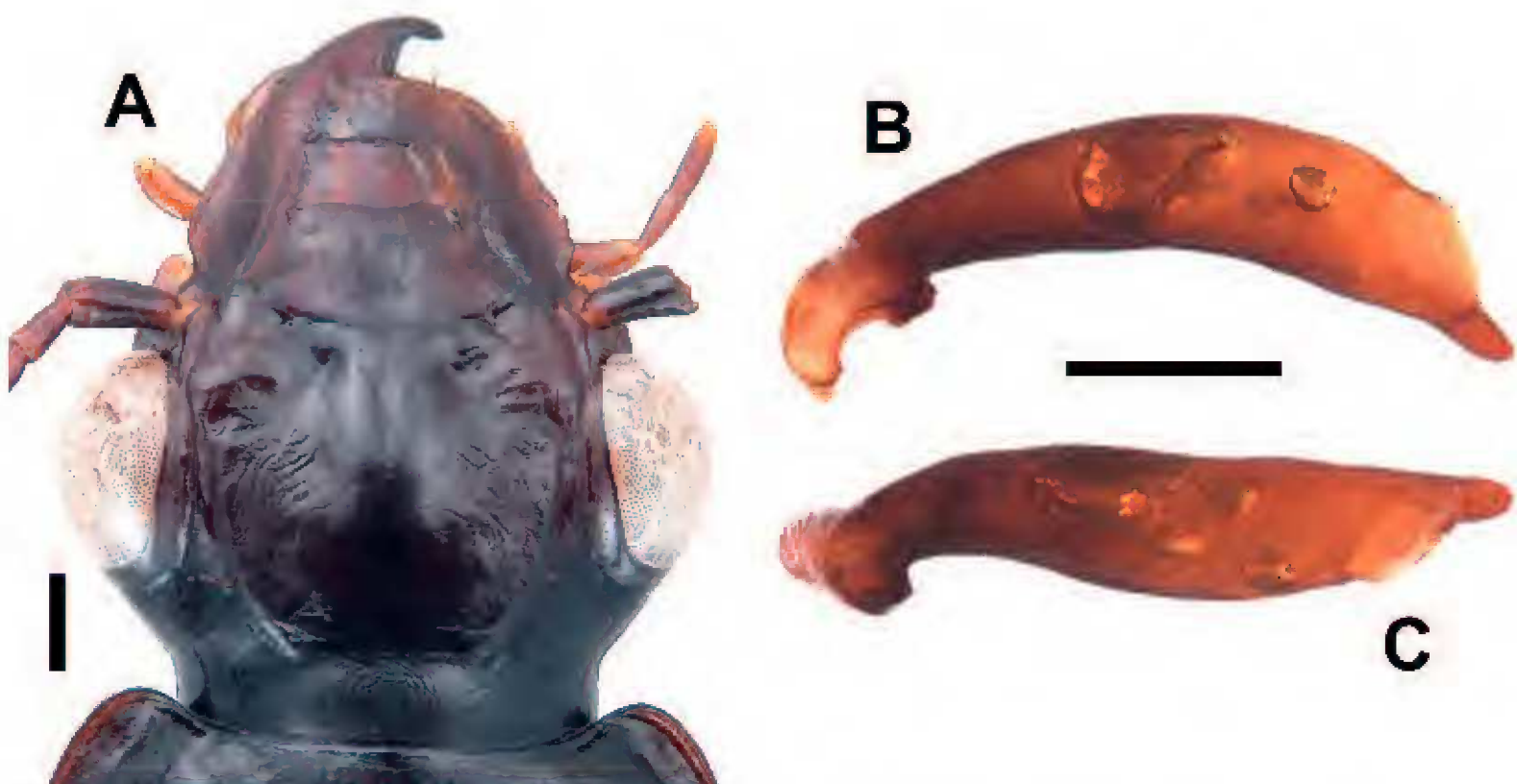


FIGURE 28. Digital images of holotype male of *Eurydera simplica* Kavanaugh & Rainio sp. nov. A. Head, dorsal aspect; B–C. Median lobe of aedeagus of genitalia; B. Left lateral aspect; C. Dorsal aspect. Scale lines = 0.5 mm.

(only 1): a female (in MNHN) labeled ““MADAGASCAR, Ranomafana NP., Talatakely, 900 m, Trail B at 1000 m mark, 15.06.2000”/ “collected by hand in daytime in secondary montane rain-forest, F. Ratalata & J. Rainio collectors”/ “7/13” [handwritten label]/ “PARATYPE *Eurydera simplica* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *simplica*, is an adjective derived from the Latin word, *simplex*, meaning simple. The name refers to the relative simplicity of form and surface macrosculpture of member of this species compared with those of other species of *Eurydera*.

RECOGNITION.— Size average for genus, SBL of male = 13.1 mm, of female = 12.4. Members of this species (Figs. 27A) are unlike those of any other species in the genus. In Jeannel’s (1949) key species of *Eurydera*, they key to his *unicolor* species group, based on the following features: size medium; head (Fig. 28A) with posterior part of frons formed as a broad, flat, smooth, elevated plateau, laterally delimited by deep furrows extended posteriorly beyond the level of the posterior margin of the eye then slightly and arcuately convergent posteriorly and terminated abruptly at the level of the posterior margin of the ocular swelling and just less than halfway from the midline to the lateral margin of the head, area between the furrow smooth and only slightly elevated; mandibles moderately short and broad; median lobe of male genitalia without a large, angulate projection on the ventral margin of the shaft near the base. Jeannel included only *Eurydera unicolor* (Klug 1833) in this species group, but Mateu (1973) added another species, *Eurydera fossulata* Mateu to the group, in part based on the shared lack of sexual dimorphism in the front tarsi in members of these two species. Unlike males of most *Eurydera* species, those of *E. unicolor* and *E. fossulata* have tarsomeres 1 to 3 no wider than in females and without ventral adhesive setae. Members of *E. simplica* are easily distinguished from those of these two species, as well as from all other described *Eurydera* species, by the uniquely shaped pronotum (Fig. 27A), which is relatively small and short for the genus, with the disc smooth, lateral explanation very narrow, lateral margins with very short and shallow sinuation anterior to markedly obtuse hind angles, and basal mar-

gin obliquely angulate laterally. Unlike males of *E. unicolor* and *E. fossulata*, those of *E. simplica* have front tarsi with tarsomeres 1 to 3 wider than in females and with at least a few adhesive setae ventrally, which may call into question a close relationship with these two species. Members of *E. simplica* also differ from those of *E. unicolor* in having the pronotum with anterior angles much less projected anteriorly. They differ from members of *E. fossulata* in having the posterior part of the head, between the lateral furrows, smooth and slightly convex, whereas *E. fossulata* members have a deep, transverse medial depression, the bottom of which is flat and covered with deep transverse creases, on that part of the head. They also have the elytral intervals without the roughened surfaces typical of members of several species in genus, including *E. fossulata* (at least subapically), and the sutural spines are very long and straight (similar to those in *E. unicolor* and *E. fossulata* members). Finally, the median lobe of male genitalia of the holotype of *E. simplica* (Fig. 28B–C) has the shaft much narrower basally and the apical orifice shorter than in *E. unicolor* males (see Jeannel 1949, Fig. 495). No male of *E. fossulata* has been available for comparison.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The two known specimens of this species both were collected by hand in daytime in secondary montane rainforest in the Talatakely area at elevations ranging from 900 to 1000 m.

Subtribe Cymindidina Laporte 1834

Ball and Hilchie (1983) considered the following two genera as subgenera of a single genus, *Hystrichopus* Boheman (1848); however we follow Casale (1998) and Lorenz (2005) in treating them as separate genera, pending a more comprehensive phylogenetic analysis of the Cymindidina.

Genus *Pseudomasoreus* Desbrochers des Loges 1904

Jeannel (1949) included only three species in his treatment of this genus for Madagascar. Mateu (1980) added six new species and provided a key to the nine Malagasy species known at that time. Casale (1998) added one additional Malagasy species, *Pseudomasoreus deuvei* Casale. This genus presently includes a total of 20 species (Lorenz 2005) with a cumulative disjunct distribution ranging from the Pyrenees of France and Spain south to southern Africa and Madagascar (Ball and Hilchie 1983).

Pseudomasoreus ranomafanae Kavanaugh and Rainio, sp. nov.

Figures 29, 30A, 30C

Deuveilla n. sp. 1; Rainio 2009: 31 (informal designation).

Lebiinae (n. sp. 1); Rainio 2012: 72 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 29A–B), a male, in CAS, labeled: “CASENT 1004471”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime from large accumulation of dead leaf, twig, and branch debris on and extended up to 2 m above forest floor”/ “HOLOTYPE *Pseudomasoreus ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 8): 1 male (in CAS) labeled same as holotype except “CASENT 1004472”; 2 males (in CAS) labeled “CASENT 1004003” and “CASENT 1004004”, respectively/

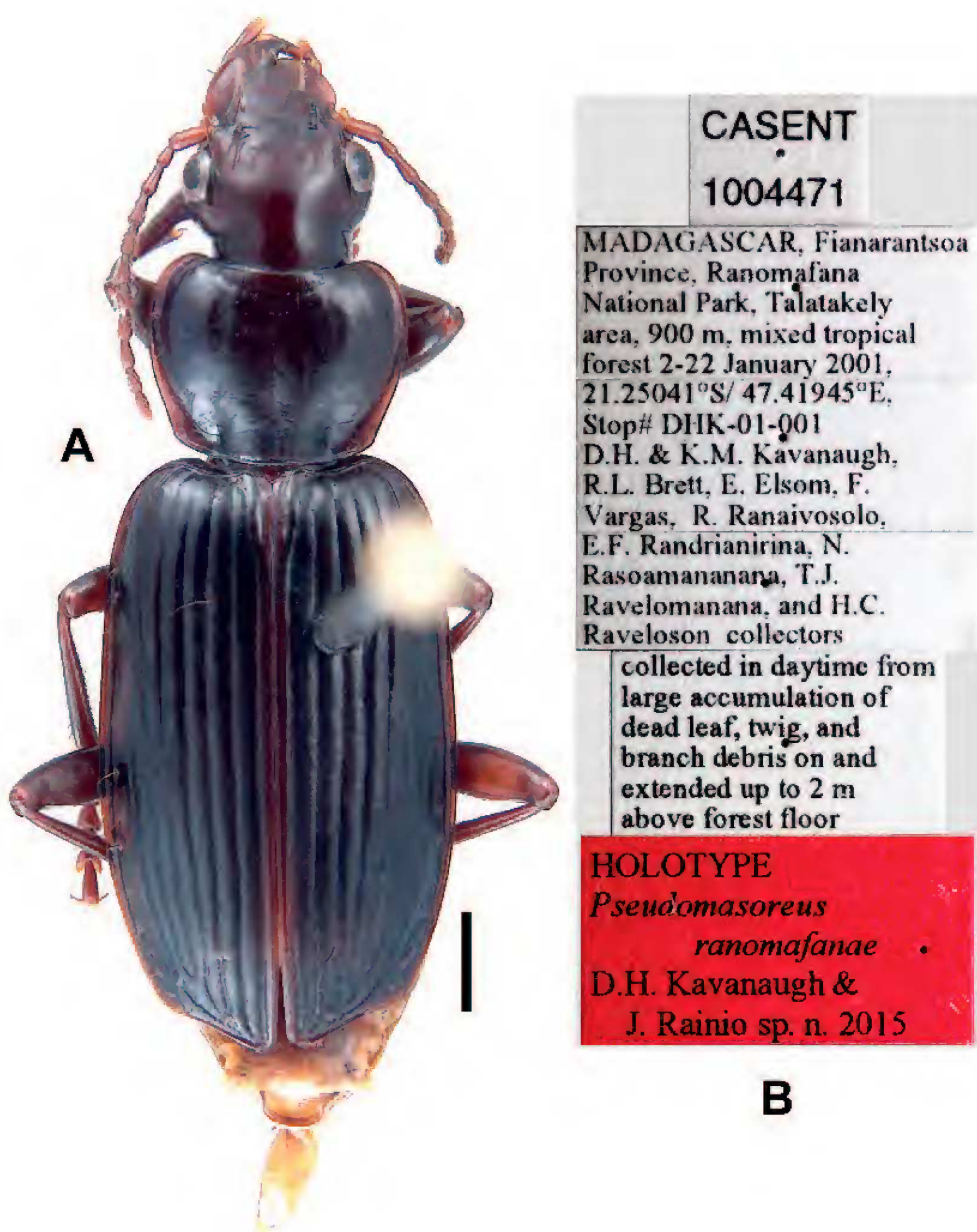


FIGURE 29. Digital images of holotype male of *Pseudomasoreus ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line A = 1.0 mm.

“MADAGASCAR, Fianarantsoa Prov-ince, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 2-22 January 2001,”/ “21.25041°S/ 47.41945°E, Stop# DHK-01-001, D.H. & K.M Kavanugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by beating live understory vegetation and/or dead leaves and other suspended debris”; 1 male (in CAS) labeled “CASENT 1002681”/ “MADAGASCAR, Fianarantsoa Prov-ince, Ranomafana National Park, Vohiparara area, 1170 m, mixed tropical forest, 2-22 January 2001,”/ “21.22644°/ 47.36979°S, Stop# DHK-01-004, D.H. & K.M Kavanugh, R.L. Brett, E. Elsom, F. Vargas, R. Ranaivosolo,”/ “E.F. Randrianirina, N. Rasoamananana, T.J. Ravelomanana, and H.C. Raveloson collectors”/ “collected in daytime by beating debris suspended in leaf whirls of *Pandanus* sp.”; 1 male and 2 females (in CAS and MNHN) labeled “CASENT 1049027”, “CASENT 1049028” and “CASENT 1049029”, respectively/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Vohiparara area, 1150 m, mixed tropical forest, 24 April 1998, 21°12.8’S 47° 23.0’E,”/ “Stop# 98-74, D. H. Kavanaugh collector beaten from vegetation at forest edge”; 1 male (in MZF) labeled “MADAGASCAR, Ranomafana NP., Talatakely, 900 m, Trail BFA 75 m, 16.03.2001”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”. All paratypes also bear the following label: “PARATYPE *Pseudomasoreus ranomafanae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

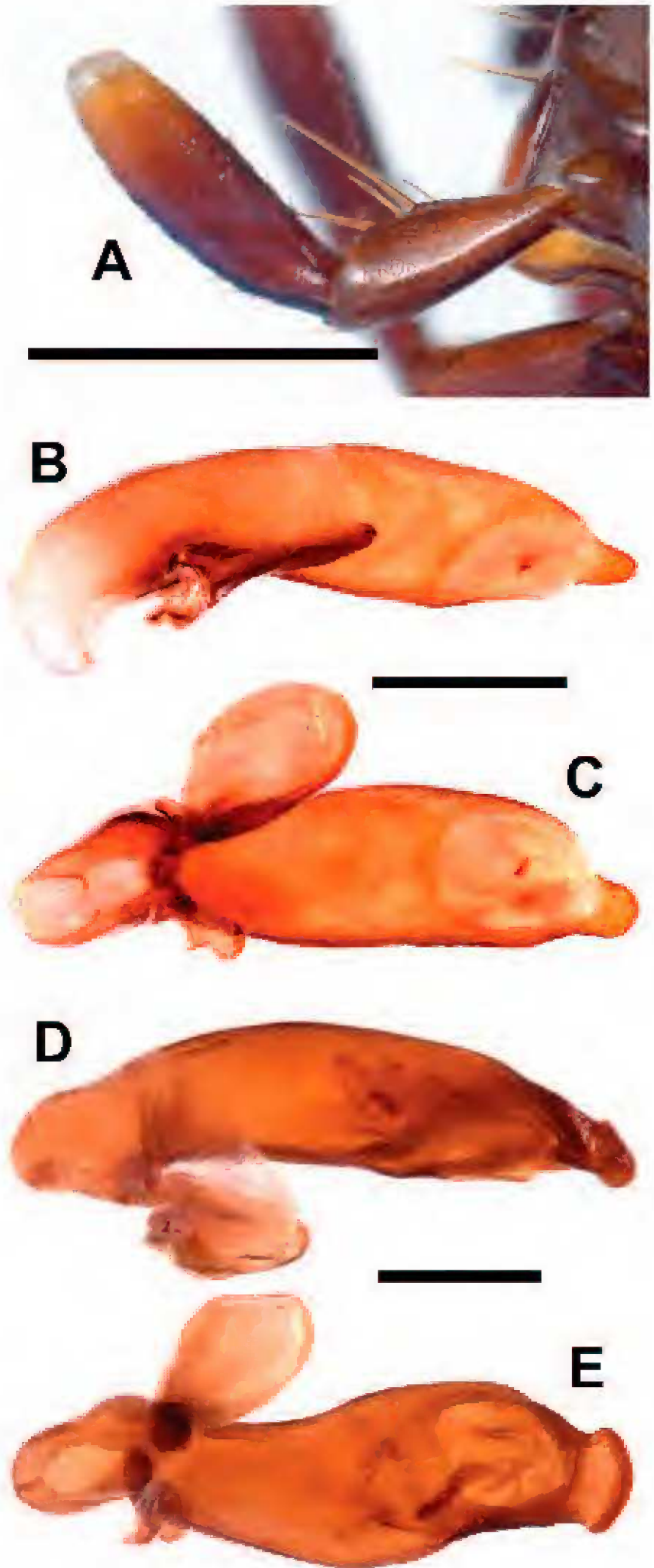


FIGURE 30. Digital images of *Pseudomasoreus* spp. A–C. Holotype male of *P. ranomafanae* Kavanaugh & Rainio sp. nov.; D, E. *P. catalai* Jeanne (from Ranomafana National Park). A. Right labial palpus, ventral aspect; B–E. Aedeagus of male genitalia; B, D. Left lateral aspect; C, E. Ventral aspect. Scale lines = 0.5 mm.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size large for genus, SBL of males = 9.7–10.6 mm, of females = 10.3 mm. In Mateu's (1980) key to the Malagasy species of this genus, members of *P. ranomafanae* (Fig. 29A) key to *Pseudomasoreus decorsei* Jeannel (1941b) based on the following combination of features: size large, SBL = 8.5 mm or more; elytra concolorous brown or piceous, without pale areas. However, they differ from the unique holotype of *P. decorsei* in having even larger body size (SBL = 8.5 mm in *P. decorsei* type), pronotum narrower overall and especially basally and with less rounded, more evident hind angles (pronotum broad, rounded, with hind angles effaced by smoothly rounded transition from lateral to basal margin in *P. decorsei* type), and elytral lateral margins nearly parallel (more evenly rounded in *P. decorsei* type). Members of *P. ranomafanae* are actually more similar to those of *P. deuvei*, which was not included in Mateu's key. They share large size, general body form with long, parallel-sided elytra, and antennomere 3 glabrous except for the apical whorl of fixed setae (additional pubescence seen in apical part of antennomere 3 in most other species of genus). However, their body size is slightly smaller on average (SBL = 10.2–11.5 in *P. deuvei* members), the pronotum is narrower overall and more narrowed basally, with the hind angles more distinct than in *P. deuvei* members and the lateral margins either straight or with slight sinuation anterior to the hind angles (lateral margins not at all sinuate in the latter). Also, the penultimate labial palpomeres in all specimens of the type series have three or four setae (Fig. 29C), whereas members of *P. deuvei* have only two such setae, a feature particularly noted by Casale in his original description. Finally, the median lobe of male genitalia (Figs. 30A,C) has the shaft slightly less arcuate and the apex slightly longer on more rounded apically than in *P. deuvei* males (see Casale 1998, Figs. 4–5). For future comparative purposes, we also provide digital photographs of the median lobe of the genitalia of a male *Pseudomasoreus catalai* Jeannel (1949) (Figs. 30B,D) [male previously unknown] to complement the illustrations of other *Pseudomasoreus* species provided by Jeannel (1949), Mateu (1980) and Casale (1998).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Specimens of this species were collected in secondary montane rainforest in the Talatakely and Vohiparara areas at elevations ranging from 900–1170 m. Adults were collected by hand, by beating live vegetation and suspended dead leaves and twigs, particularly dead leaves suspended in leaf whirls of *Pandanus* sp. Two specimens were found in daytime in masses of dead leaves, twigs and branch debris accumulated on the forest floor.

Genus *Assadecma* Basilewsky 1982

This genus is precinctive to Madagascar and previously represented only by the type species, *Assadecma madagascariensis* Basilewsky (1982).

Assadecma basilewskyi Kavanaugh and Rainio, sp. nov.

Figure 31A–B, 32

TYPE MATERIAL.— Holotype (Figs. 31A–B), a male, in NMNH, labeled: “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 940m 21°16'S, 47°25'E 18 April 1994”/ “pitfall traps in montane rainforest, E. Rajeriarison & R. Malenky”/ “HOLOTYPE *Assadecma basilewskyi* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 2): 1 male (in NMNH) labeled same as holotype; 1 male (in CAS) labeled “CASENT 1051147”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 900 m, mixed tropical forest, 26 April

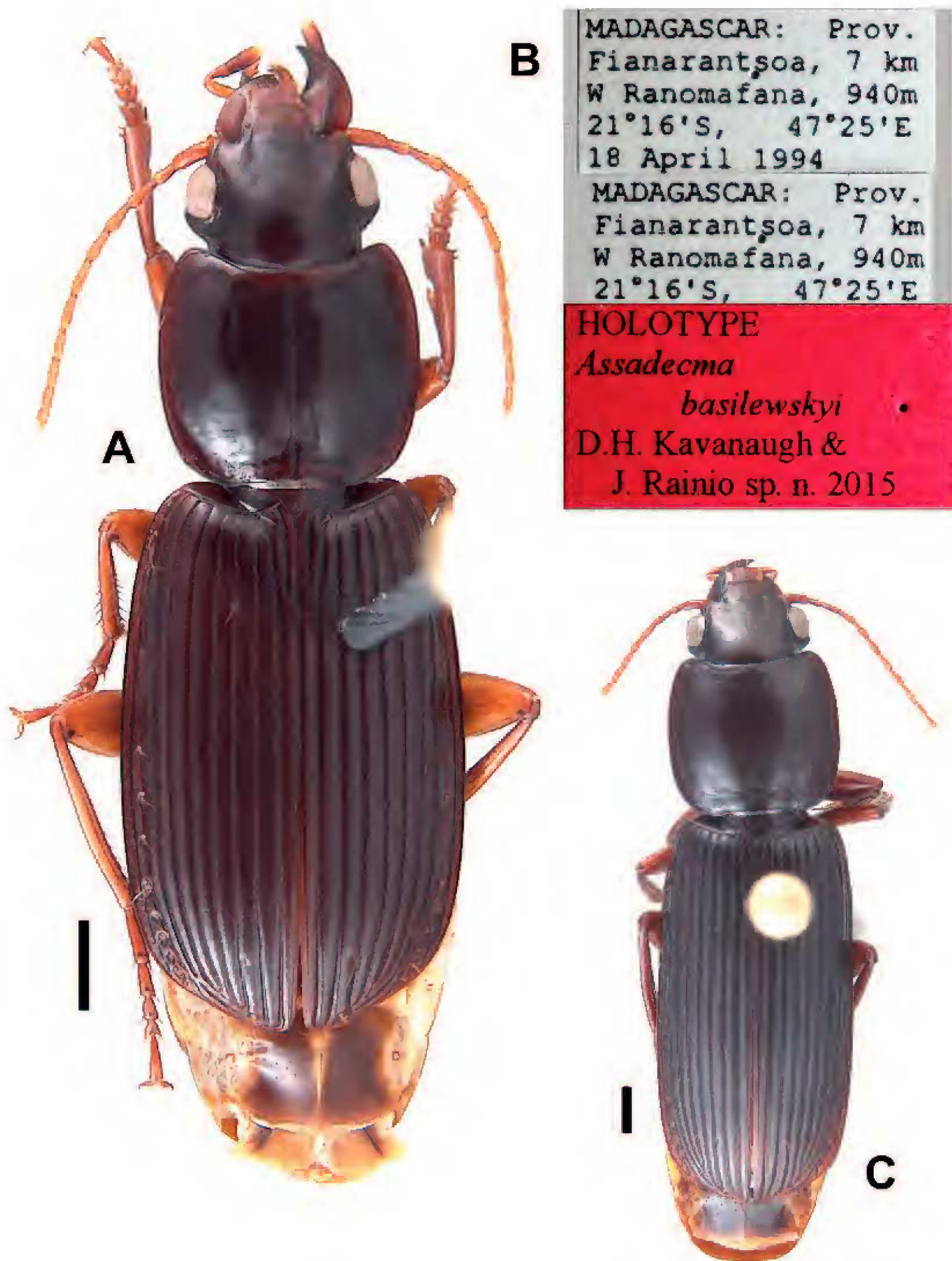


FIGURE 31. Digital images of *Assadecema* spp. A–B. Holotype male of *Assadecma basilewskyi* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C. *A. madagascariensis* Basilewsky female, dorsal habitus. Scale lines = 1.0 mm.

1998.”/ “21°15.3’S 47°25.9’E, Stop # 98-84 D.H. Kavanaugh collector collected at night on ground beside trail in forest”. Both paratypes also bear the following label: “PARATYPE *Assadecma basilewskyi* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *basilewskyi*, is a noun in apposition, based from the surname of Dr. Pierre Basilewsky, now deceased, who was for many years a lead entomologist at the Koninklijk Museum voor Midden Africa (Musée Royal de l’Afrique Centrale) in Tervuren. We are pleased to name this new species in honor of Dr. Basilewsky’s many contributions to knowledge of the carabid beetle faunas of the Afrotropical Region in general and Madagascar in particular.

RECOGNITION.— Small for genus, SBL of males = 9.5–10.8 mm, female unknown. Basilewsky (1982) included a single species, *A. madagascariensis* in this genus. We have examined the holotype male of that species and found several features that differ with those found in specimens of *A. basilewskyi* (Fig. 31A). The former is much larger (SBL = 12.9 mm), (about the same size as the *A. madagascariensis* female illustrated in Fig. 31C) than males of *A. basilewskyi*. Its elytral microsculpture is comprised of markedly transverse sculpticells, producing distinct iridescence, whereas in *A. basilewskyi* the sculpticells are only slightly transverse, producing no evident iridescence. Also the relative body shapes and proportions of males of the two species are distinctly different. In *A. madagascariensis*, the elytra are long (ratio EL/PL = about 2.5) and the elytral lateral margins are nearly parallel for most of their length (same as in the female, Fig. 31C). In *A. basilewskyi*, the elytra are relatively shorter (ratio EL/PL = about 2.3) and the elytral lateral margins are slightly rounded throughout (Fig. 31A). Front tarsomere 4 in males of *A. basilewskyi* (Fig. 32A) is not as short and broad as that in *A. madagascariensis* (see Basilewsky, 1982:23, Fig. 3a). Finally, the median lobes of the genitalia of *A. basilewskyi* males (Fig. 32B–C) and *A. madagascariensis* males (see Basilewsky 1982:22, Fig. 2d) are markedly different in form.

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— The holotype and one paratype of this species were collected in a pitfall trap in montane rainforest at an elevation of 940 m. The second paratype was found at night walking on the ground beside a trail in the same general area.

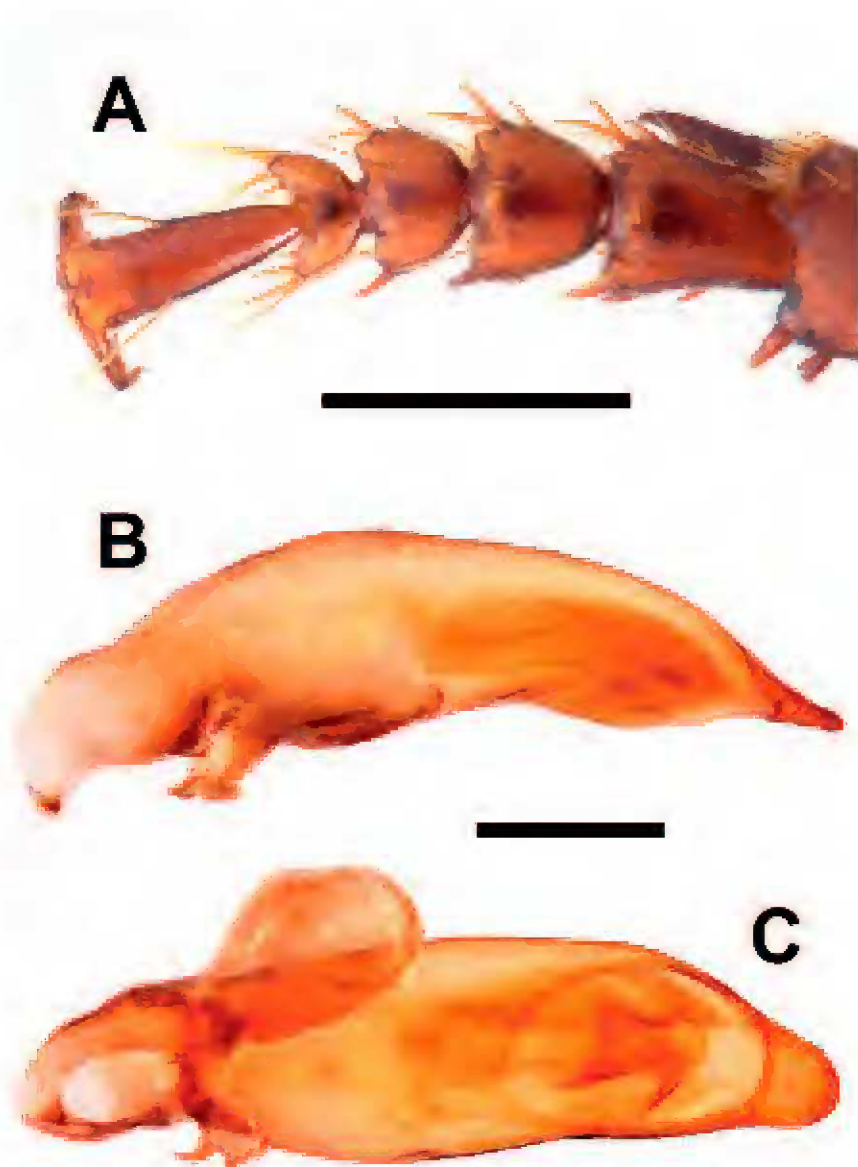


FIGURE 32. Digital images of holotype male of *Assadecma basilewskyi* Kavanaugh & Rainio sp. nov. A. Left front tarsus, dorsal aspect; B–C. Aedeagus of male genitalia; B. Left lateral aspect; C. Ventral aspect. Scale lines = 0.5 mm.

Subtribe Lebiina Bonelli 1810**Genus *Lebia* Latreille 1802**

As currently conceived, this genus is a megadiverse taxon with hundreds of species arrayed in 16 subgenera (Lorenz 2005) and with a worldwide distribution in tropical to temperate regions. Jeannel (1949) considered *Lebia* and *Nematopeza* Chaudoir (1870) as distinct genera, but the latter is now generally treated as a subgenus of the former (Lorenz 2005).

Subgenus *Metalebia* Jeannel 1949

Jeannel (1949) considered this subgenus to include most of the *Lebia* species of tropical Africa, Madagascar, and India. He reported 18 species in his treatment of the Malagasy fauna. Lorenz (2005) lists a total of 36 species for this subgenus.

***Lebia (Metalebia) laterolucida* Kavanaugh and Rainio, sp. nov.**

Figure 33

TYPE MATERIAL.— Holotype (Figs. 33A–B), a female, in CAS, labeled: “CASENT 1006164”/MADAGASCAR Fianarantsoa Prov. Parc National Ranomafana Bell Vue Trail, tropical forest 21°15.5’S 47°25.6’E 1000 m M.E.Irwin and E.I. Schlinger MEI 99-MA-7 21-XII-1999”/ “HOLOTYPE *Lebia (Metalebia) laterolucida* Kavanaugh & Rainio sp. n. 2015” [red label].

Paratypes (only 1): a female (in CAS) labelled “CASENT 1049030”/ “MADAGASCAR, Fianarantsoa Province, Ranomafana National Park, Talatakely area, 850 m, 13 April 1998,”/ “21°14’S 47°22’E Malaise trap in mixed tropical forest, M.E.Irwin and E.I. Schlinger collectors, Stop 98-MAD-1”/ “PARATYPE *Lebia (Metalebia) laterolucida* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *laterolucida*, is an adjective derived from the Latin words, *lateris*, meaning side, and *lucidus*, meaning bright or full of light. The name refers to the pale, translucent lateral pronotal margins, which contrast markedly with the dark pronotal disc in members of this species.

RECOGNITION.— Size moderate for genus, SBL of females = 4.5–5.0 mm. Members of this species (Fig. 33A) key to subgenus *Metalebia* Jeannel (1949) and the *madagascariensis* group in Jeannel’s (1949) key: the basal elytral border is absent medially between the base of stria 3 and the scutellum; the elytral striae are deep and the elytral intervals convex and impunctate; the forebody (head plus pronotum) has no metallic reflection and the elytra are uniform in color; and the frons is slightly convex and without distinct frontal furrows between the eyes. Within the *madagascariensis* group, *L. laterolucida* members are distinguished from those of *L. alluaudana* Jeannel (1949), *L. apicoviolacea* sp. nov., *L. mirana* Alluaud (1936a), *L. ranomafanae* sp. nov., and *L. tanala* Jeannel (1949) by the absence of metallic reflection on the elytra and punctuation of the anterior dorsum of the head (both features present in members of the other five species). They differ from members of *L. sulcipennis* (Fairmaire) (1889), *L. nana* Jeannel (1949), and *L. perrieri* Jeannel (1949) in having the pronotum broad, ratio PW/PL = at least 1.5, and with lateral margins distinctly rounded at least in the anterior half pronotum (narrower and less rounded anteriorly in members of the three other species). From adults of *L. rufa* Jeannel (1949), they differ in having the pronotal basal lobe distinctly margined (absent from the former). *Lebia laterolucida* adults are most similar to those of the two remaining species in Jeannel’s key, *L. brunneipennis* Jeannel

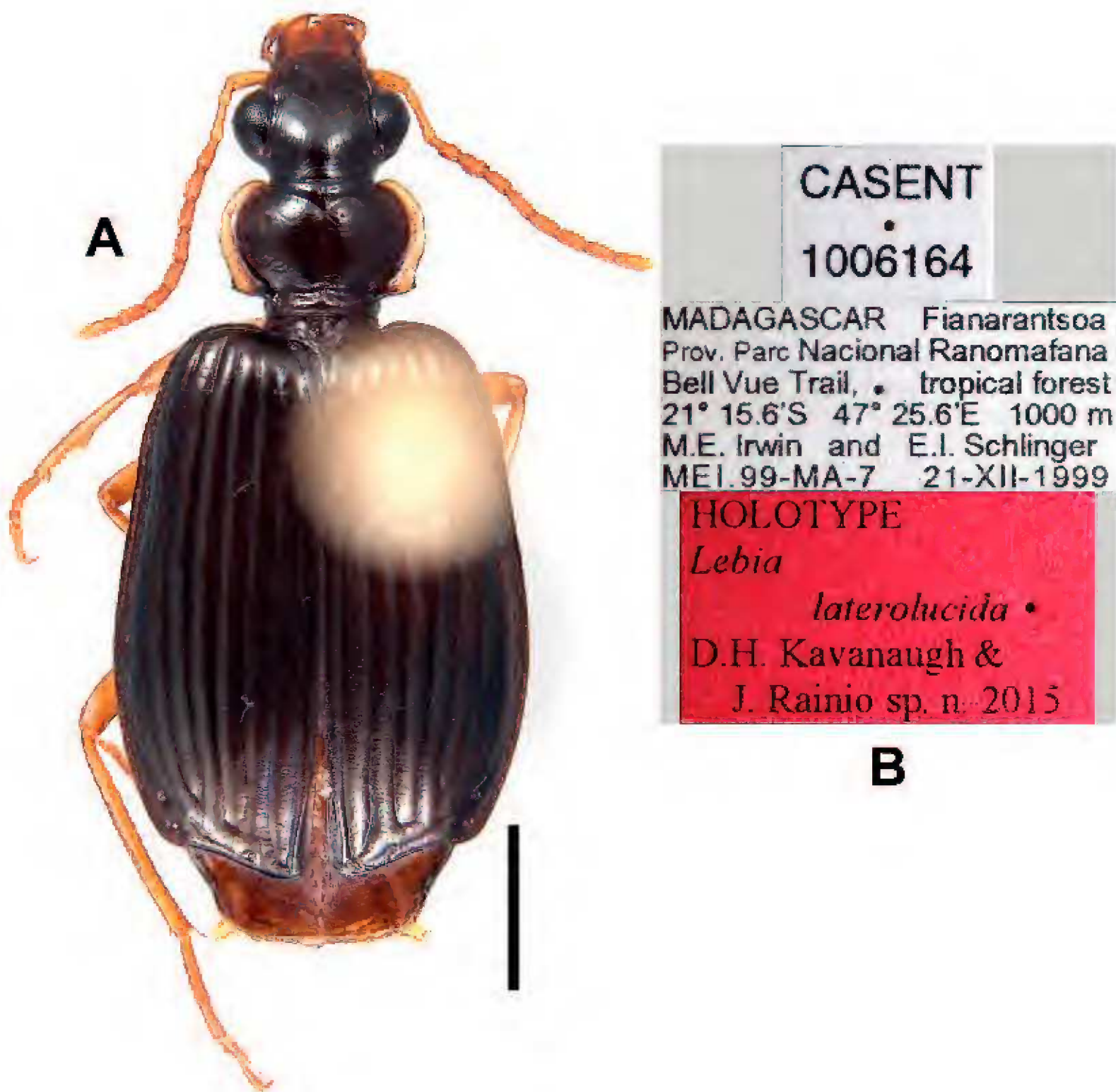


FIGURE 33. Digital images of holotype female of *Lebia* (*Metalebia*) *laterolucida* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

(1949) and *L. madagascariensis* Chaudoir (1850), but differ from them in having the dorsum of the head, pronotum and elytra dark piceous, with markedly contrasting pale yellow lateral pronotal margins (dorsum uniformly reddish brown and the lateral pronotal margins not or less markedly contrasting in color in the together two species). In addition, they are distinctly smaller than *L. madagascariensis* adults and have distinct elytral microsculpture (absent or at least very faint in *L. brunneipennis* adults).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Both specimens of the type series were collected in mixed secondary tropical forest in the Talatakely area in malaise traps.

***Lebia (Metalebia) ranomafanae* Kavanaugh and Rainio, sp. nov.**

Figure 34

TYPE MATERIAL.— Holotype (Figs. 34A–B), a male, in NMNH, labeled: “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 1100m 22-31 October 1988 W. E. Steiner”/ “Malaise trap in small clearing, montane rain forest”/ “HOLOTYPE *Lebia (Metalebia) ranomafanae* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in CAS) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 900m 23-28 February 1990 W. E. Steiner”/ “Malaise trap in small clearing, montane rain forest”/ “PARATYPE *Lebia (Metalebia) ranomafanae* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size slightly small for genus, SBL of male = 4.3 mm, of female = 4.2 mm. Members of this species (Fig. 34A) key to subgenus *Metalebia* Jeannel (1949) and the *madagascariensis* group in Jeannel’s (1949) key: the basal elytral border is absent medially between the base of stria 3 and the scutellum; the elytral striae are deep and the elytral intervals convex and impunctate; the forebody (head plus pronotum) has no metallic reflection and the elytra are uniform in color (but not necessarily in reflection); and the frons is slightly convex and without distinct frontal furrows between the eyes. Within the *madagascariensis* group, *L. ranomafanae* members can be distinguished from those of all species except *L. alluaudana*, *L. apicoviolacea* sp. nov., *L. mirana* and *L. tanala* by the presence of elytral metallic reflection (metallic reflection absent from the elytra of members of the remaining seven species). They are distinguished from members of *L. mirana* by their reddish labrum (black in *L. mirana* members) and from those of *L. alluaudana* by their small size and relatively short and broad elytra, with ratio of elytra length to width = 1.3 (size larger, SBL of males = 4.6–5.0 mm, of females 4.6–5.3 mm, and elytra relatively longer, with ratio EL/EW = 1.4, in *L. alluaudana* members). They are distinguished from members of *L. tanala* in having very dark and relatively faint elytral metallic reflection, pronotum with anterior angles indistinct, smoothly rounded from apical to lateral margin and not at all projected anteriorly beyond apical margin, lateral margins nearly parallel in posterior two-thirds and not or only very slightly sinuate anterior to obtusely angulate hind angles (elytral metallic reflection more distinct, pronotum with anterior angles broadly round but slightly projected anteriorly beyond apical margin, lateral margins distinctly sinuate anterior to sharp, rectangular hind angles slightly projected laterally in members of *L. tanala*). Finally, they can be distinguished from members of *L. apicoviolacea* by slightly larger size and the faint, concolorous dark blue-green elytral metallic reflection and (size slightly smaller, SBL of male = 3.8 mm, of female = 4.0 mm, and elytra with distinct tricolored metallic reflection, green basally and on medial two-thirds, brassy on lateral one-third and violet in apical one-fifth, in *L. apicoviolacea* members. Shape of the median lobe of the male aedeagus (Fig. 34C–D) is also diagnostic, with the shaft broadest at basal one-third, slightly and evenly arcuate on ventral margin in lateral view (Fig. 34C) and apex parallel-side basally and broadly rounded apically in dorsal view (Fig. 34D).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Both specimens of the type series were collected in malaise traps in secondary montane rainforest in the Talatakely area at elevations ranging from 900 to 1100 m.

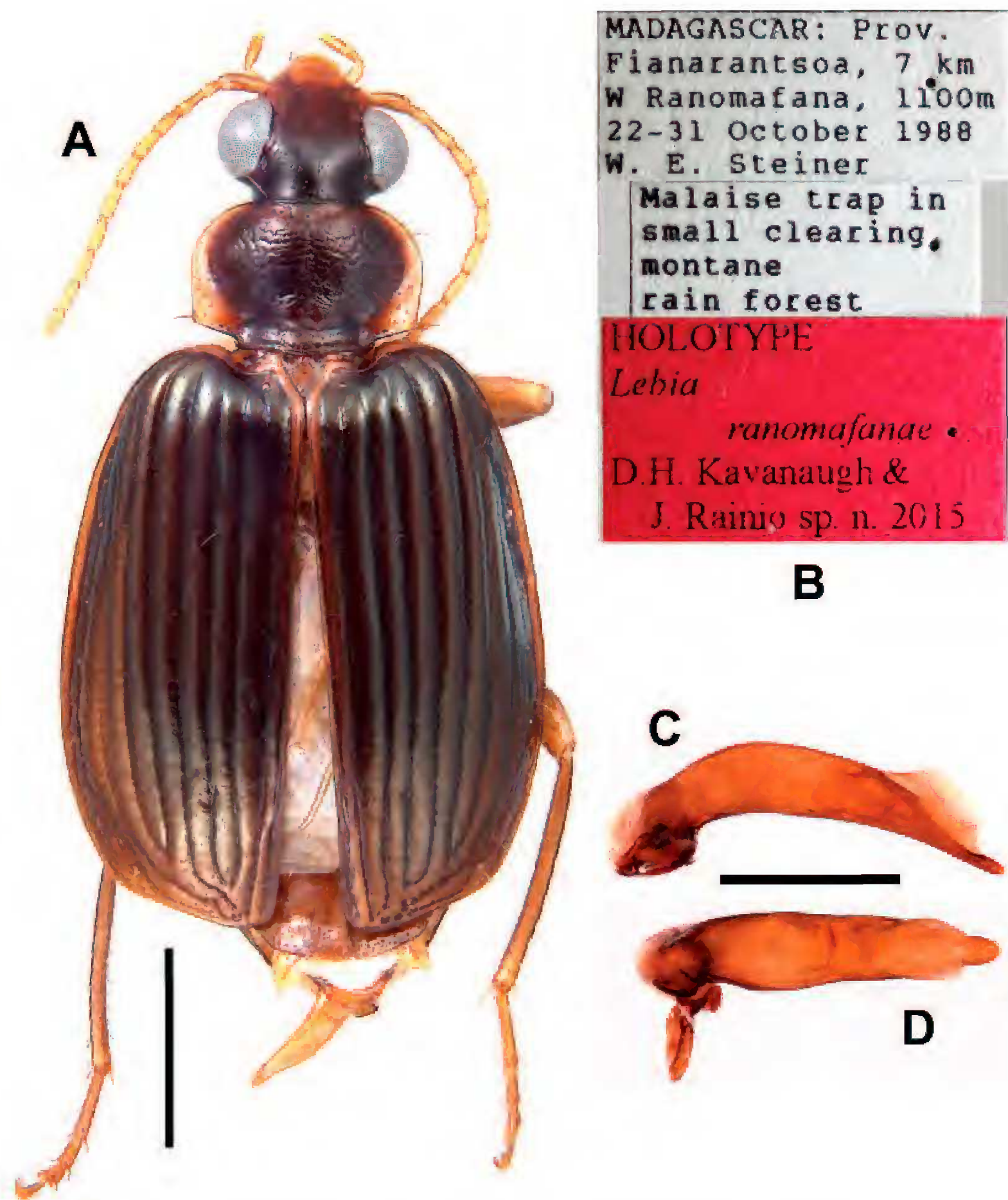


FIGURE 34. Digital images of holotype male of *Lebia* (*Metalebia*) *ranomafanae* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C–D. Aedeagus of male genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines = 0.5 mm.

Lebia (Metalebia) apicoviolacea Kavanaugh and Rainio, sp. nov.

Figure 35

TYPE MATERIAL.— Holotype (Figs. 35A–B), a male, in CAS, labeled: “MADAGASCAR: Fianaran. Pr. Ranomafana N.P. HQ. area 21°15'24"S 47°25'15"E 25NOV1994, at night M.A. Ivie & D.A. Pollack”/ “HOLOTYPE *Lebia (Metalebia) apicoviolacea* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (only 1): a female (in NMHN) labeled “MADAGASCAR: Prov. Fianarantsoa, 7 km W Ranomafana, 1100 m 6-21 October 1988 W. E. Steiner”/ “At black light in montane rain forest”/ “PARATYPE *Lebia (Metalebia) apicoviolacea* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *apicoviolacea*, is an adjective derived from the Latin words, *apex*, meaning tip, and *violaceus*, meaning violet-colored. The name refers

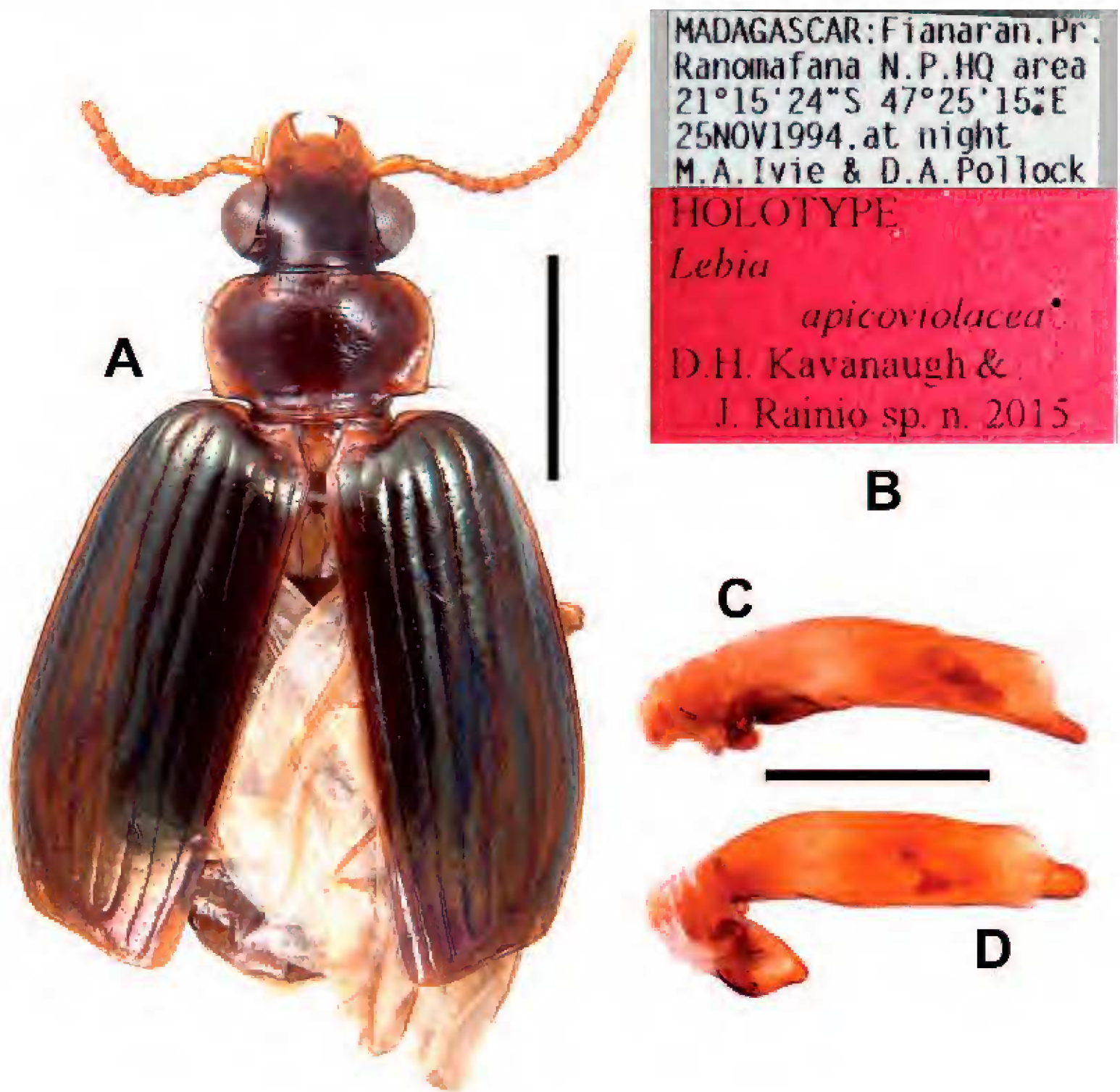


FIGURE 35. Digital images of holotype male of *Lebia (Metalebia) apicoviolacea* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels; C–D. Aedeagus of male genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines A = 1.0 mm, C–D = 0.5 mm.

to the violet or purple metallic reflection of elytral apices, which contrasts distinctly with the green or bronze metallic reflection of the remainder of the elytra in members of this species.

RECOGNITION.— Size moderately small for genus, SBL of male = 3.8 mm, of female = 4.0 mm. Members of this species (Fig. 35A) key to subgenus *Metalebia* Jeannel (1949) and the *madagascariensis* group in Jeannel's (1949) key: the basal elytral border is absent medially between the base of stria 3 and the scutellum; the elytral striae are deep and the elytral intervals convex and impunctate; the forebody has no metallic reflection and the elytra are uniform in color (but not necessarily in reflection); and the frons is slightly convex and without distinct frontal furrows between the eyes. Within the *madagascariensis* group, *L. apicoviolacea* members can be distinguished from those of all species except *L. alluaudana*, *L. mirana* Alluaud, *L. ranomafanae* and *L. tanala* by the presence of elytral metallic reflection (metallic reflection absent from the elytra of members of the remaining seven species). They are distinguished from members of *L. mirana* by their reddish labrum (black in *L. mirana* members) and from those of *L. alluaudana* by their small size and relatively short and broad elytra, with ratio of elytra length to width = 1.2–1.3 (size larger, SBL of males = 4.6–5.0 mm, of females 4.6–5.3 mm, and elytra relatively longer, with ratio of elytra length to width = 1.4, in *L. alluaudana* members). They are distinguished from members of *L. tanala* in having the pronotum with lateral margins slightly sinuate anterior to slightly obtuse hind angles (lateral margins distinctly sinuate anterior to sharp, rectangular hind angles slightly projected laterally in members of *L. tanala*) and from members of both *L. ranomafanae* and *L. tanala* in having elytra with distinct tricolored metallic reflection, green basally and on medial two-thirds, brassy on lateral one-third and violet in apical one-fifth (elytral metallic reflection uniformly faint or distinct metallic green or blue in members of *L. ranomafanae* and *L. tanala*). Shape of the median lobe of the male aedeagus (Fig. 35C–D) is also diagnostic, with the shaft very slightly arcuate, dorsal and ventral margins more or less parallel in basal two-thirds in lateral view (Fig. 35C) and apex moderate in length and relatively broader in both lateral and dorsal (Fig. 35D) views than in males of other species of this species group (compare with Jeannel 1949, Fig. 440a–l).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Both specimens of the type series were collected in secondary montane rainforest in the Talatakely area at elevations ranging from 900 to 1100 m. Both were collected at night, one by hand from vegetation, and the other attracted to ultraviolet light.

Tribe Galeritini LeConte 1853

Genus *Eunostus* LaPorte 1835

This genus occurs only in Africa and Madagascar (Jeannel 1949) and includes 14 previously described species (Lorenz 2005), six of which are endemic to Madagascar. Jeannel (1949) provided a key to the six Malagasy species known to him.

Eunostus minimus Kavanaugh and Rainio, sp. nov.

Figures 36–37

Eunostus n. sp. 1; Rainio 2009: 31, Rainio 2012: 72 (informal designation).

TYPE MATERIAL.— Holotype (Figs. 36A–B), a male, in CAS, labeled: “CASENT 8069195”/ “MADAGASCAR: Fianarantsoa Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana elev 1100m 27-31 Mar 2003”/ “21°17'24”S 047°26'00”E California Acad. of Sciences coll. Fisher, Griswold et al. sifted litter, montane rainforest collection code: BLF8400”/ “HOLOTYPE *Eunostus minimus* Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of

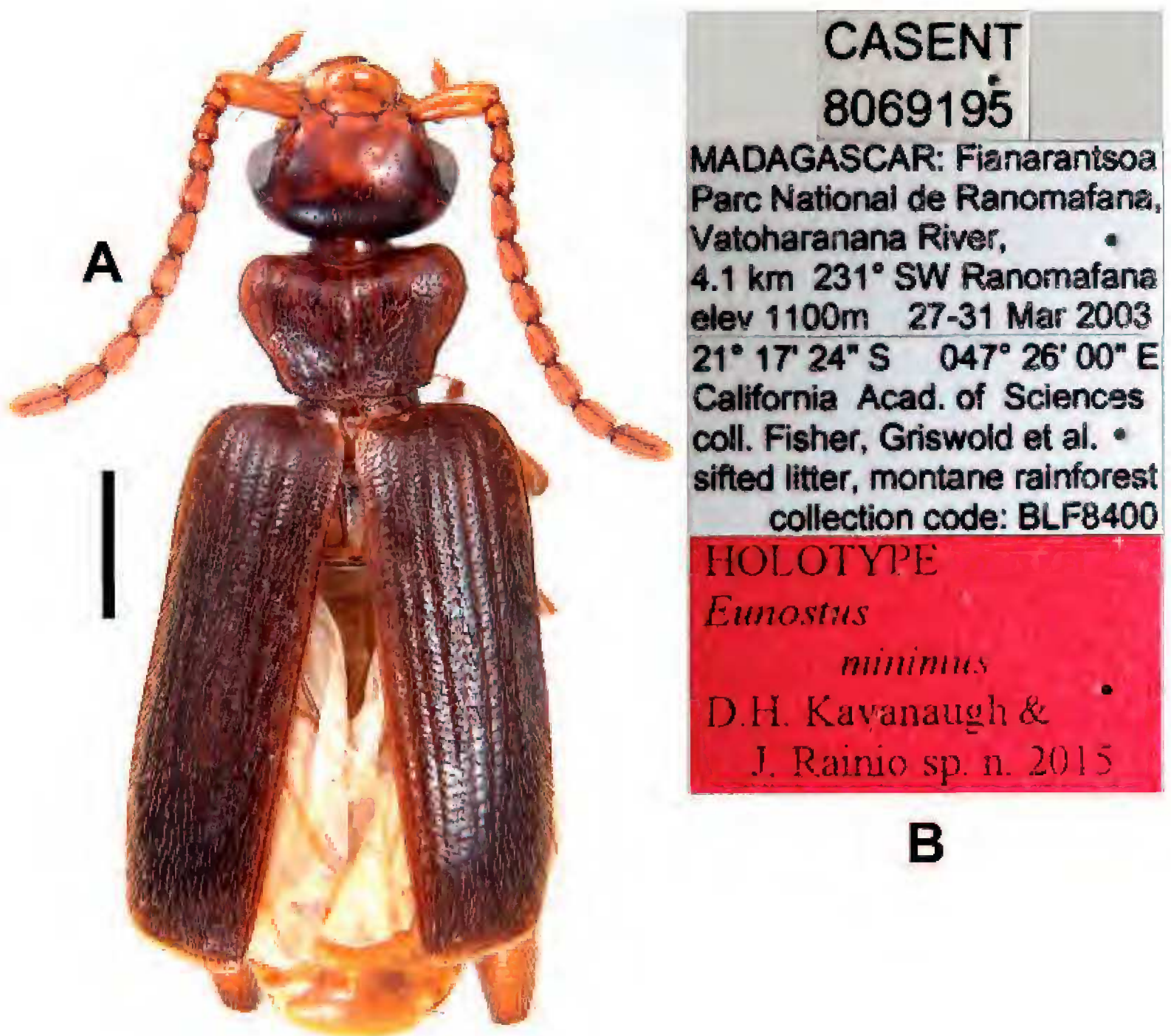


FIGURE 36. Digital images of holotype male of *Eunostus minimus* Kavanaugh & Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line A = 1.0 mm.

2): 1 male (in MNHN) labeled “CASENT 8069129”/ “MADAGASCAR: Fianarantsoa, Ranomafana JIRAMA water works, 21°14.91’S, 047°27.13’E”/ “21-24 December 2001 collector: R. Harin’Hala California Acad of Sciences malaise trap near river elev. 690 m, MA-02-09D-08”; 1 female (in CAS) labeled “CASENT 1051146”/ “MADAGASCAR Ranomafana NP, Vatoharana trail S 600 24.8.2004”/ “collected by hand in daytime, F. Ratalata & J. Rainio collectors”. Both paratypes also bear the following label: “PARATYPE *Eunostus minimus* Kavanaugh & Rainio sp. n. 2015” [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *minimus*, is the Latin adjective meaning smallest, a reference to fact that the known specimens of this species are smaller than those of any of the other known species that we have examined.

RECOGNITION.— Small for genus, SBL of male = 5.5 mm, of female 5.0–5.1 mm. Members of this species (Fig. 36A) do not key out in Jeannel’s (1949) key for *Eunostus* species. They are much smaller and shinier than members of any other described species. Their heads are slightly narrower, with the tempora more evenly rounded to the back of the head, their antennal scapes

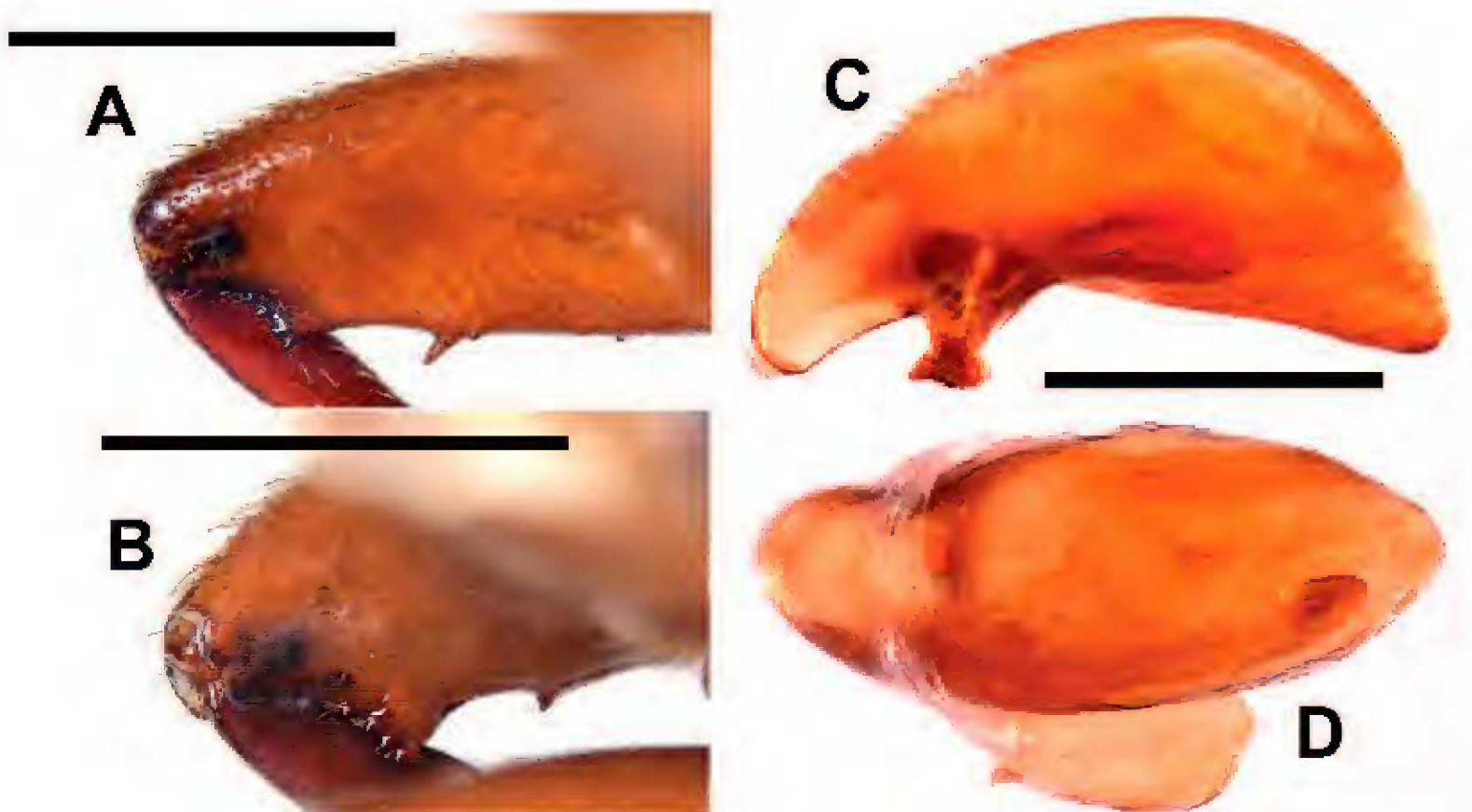


FIGURE 37. Digital images of *Eunostus minimus* Kavanaugh & Rainio sp. nov. A–B. Apical part of left hind femur, oblique medial aspect; A. Holotype male; B. Female; C–D. Aedeagus of holotype male genitalia; C. Left lateral aspect; D. Dorsal aspect. Scale lines = 0.5 mm.

shorter and thicker than in other species, thickest slightly distal to mid-length. Lateral margins of the pronotum are smoothly rounded in anterior half with a moderately short and deep subbasal sinuation anterior to slightly obtuse to rectangular hind angles. The elytral setae are generally sparser than in other species and arranged in 2 more or less distinct longitudinal rows on each interval. Male (Fig. 37A) and female (Fig. 37B) hind femora are sexual dimorphic, each unique among Malagasy species for each sex. Median lobe of male genitalia Figs. 37C–D markedly different in shape from those of the other species for which males are known (see Jeannel 1949, Fig. 513d–e).

GEOGRAPHICAL DISTRIBUTION.— At present, known only from the type locality.

HABITAT DISTRIBUTION.— Specimens of the type series were collected in both primary montane rainforest in the Vatoharanana area (at elevations ranging from of 1100 to 1200 m) and in secondary montane rainforest 1 km north of Ranomafana village at an elevation of 690 m. The specimens were collected in a malaise trap and sifted from forest litter, respectively, at the primary forest site and by hand at the secondary forest site.

Tribe Helluonini Hope 1838

Genus *Erephognathus* Alluaud 1932

This genus is endemic to Madagascar and includes only two previously described species (Lorenz 2005). Jeannel (1949) provided a key to those species.

Erephognathus ranomafanae Kavanaugh and Rainio, sp. nov.

Figure 38

TYPE MATERIAL.— Holotype (Figs. 38A–B), a female, in CAS, labeled: “CASENT 8068531”/ “MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Vohiparara, at broken

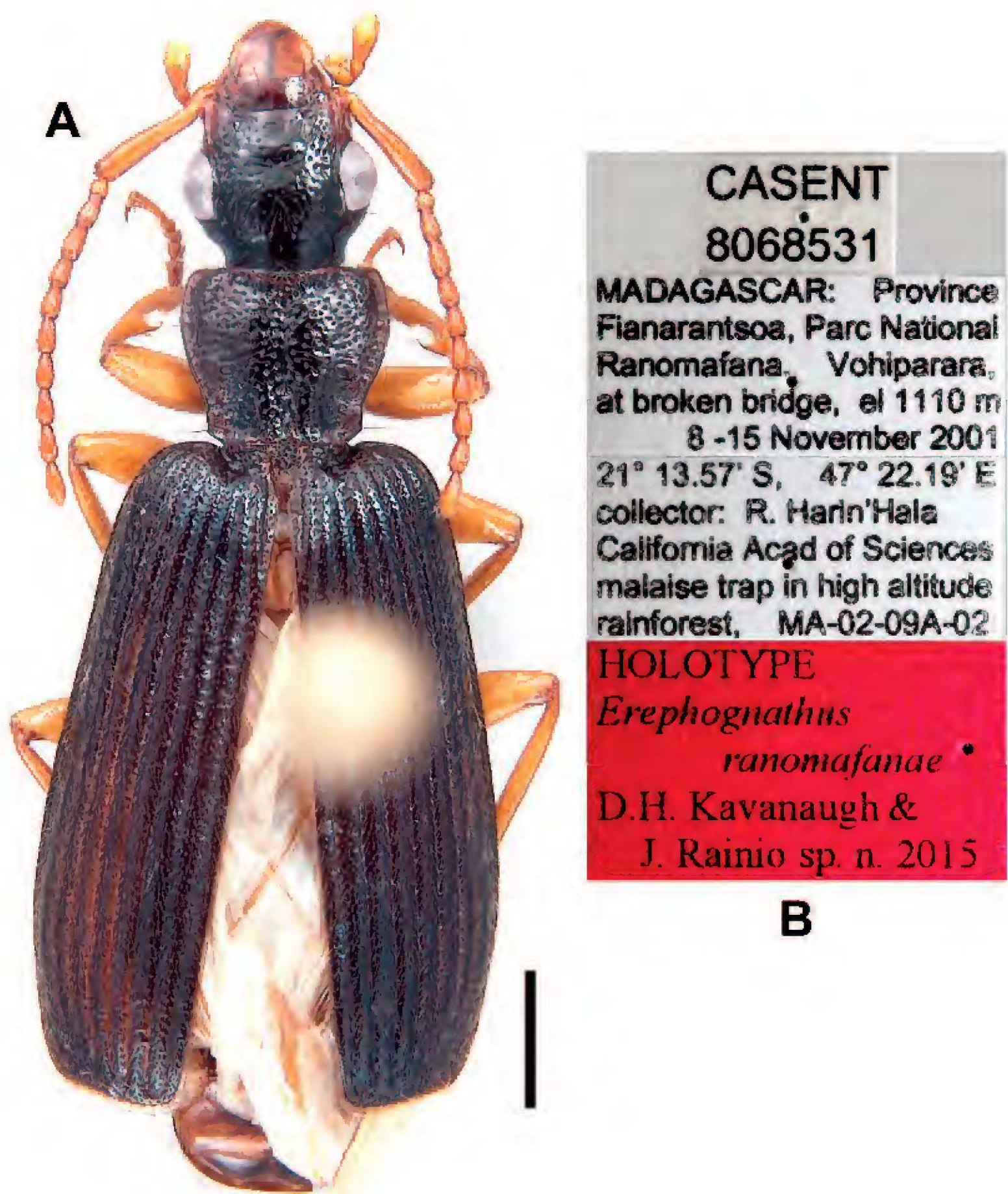


FIGURE 38. Digital images of holotype female of *Erephognathus ranomafanae* Kavanaugh and Rainio sp. nov. A. Habitus, dorsal aspect; B. Labels. Scale line = 1.0 mm.

bridge, el 1110 m 8-15 November 2001”/ “21°13.57’S, 047°22.19’E collector: R. Harin’Hala Cal-
ifornia Acad of Sciences malaise trap in high altitude rainforest, MA-02-09A-02”/ “HOLOTYPE
Erephognathus ranomafanae Kavanaugh & Rainio sp. n. 2015” [red label]. Paratypes (total of 2):
1 female (in CAS) labeled same as holotype, except “CASENT 8068532”; 1 female (in CAS)
labeled “CASENT 8068672”/; “MADAGASCAR: Province d’Antananarivo 3 km 41° NE Andra-
nomay, 11.5 km 147° SSE Anjozorobe elev 1300 m 5-13 December 2000”/ “18°28’24”S

47°57'38"E coll. Fisher, Griswold et al. California Acad. of Sciences montane rainforest, malaise trap, coll. code: BLF2375". Both paratypes also bear the following label: "PARATYPE *Erephognathus ranomafanae* Kavanaugh & Rainio sp. n. 2015" [yellow label].

TYPE LOCALITY.— Madagascar, Fianarantsoa Province, Ranomafana National Park.

DERIVATION OF SPECIES NAME.— The species epithet, *ranomafanae*, is a noun in apposition, derived from the name of the national park in which the type was collected.

RECOGNITION.— Size moderate for genus, SBL of females = 7.5 - 8.9 mm. In Jeannel's (1949) key to species of *Erephognathus*, members of *E. ranomafanae* key to *E. coerulescens* (Fairmaire 1903) based on their short antennae (extended posteriorly only to the basal one-fourth of the elytra or less) and the absence of the tuft of setae from the apex of antennomere 11 (terminal antennomere) found in *E. margaritrix* Alluaud (1936a) members. The pronotum (Fig. 38A) is distinctly longer, narrower and less convex and with anterior angles more projected, narrowed and angulate than in members of *E. coerulescens*.

GEOGRAPHICAL DISTRIBUTION.— We have examined specimens from only two areas. Two female specimens were collected in Ranomafana National Park, the type locality, on the eastern slope off the central plateau in the northeastern part of the southern half of the island of Madagascar. A third specimen, also a female, was collected near Anjozorobe, in Antananarivo Province, slightly north of the center of the island and just over 300 km north of Ranomafana along the eastern slope off the central plateau. No specimens have been recorded from intervening areas.

HABITAT DISTRIBUTION.— Specimens of the type series were all collected in malaise traps in montane rainforest at elevations ranging from 1110 to 1300 m.

ACKNOWLEDGEMENTS

Fieldwork conducted by DHK and other staff from the California Academy of Sciences and their Malagasy colleagues was generously supported by a grant from Oracle Corporation, Redwood City, California. The Academy of Finland provided similar support for JR and her team during their work in Ranomafana and the Finnish Cultural Foundation provided a grant for the descriptions of new species. We also gratefully acknowledge the Institute for the Conservation of Tropical Environments (ICTE) at Stony Brook University and Madagascar Institute pour la Conservation des environnements Tropicaux (MICET) in Madagascar for providing superb logistical support and facilitating permits for our work in Ranomafana National Park. Finally, we must thank Roberta Brett, Emily Elsom Cunningham, Charles Griswold, Kathryn Kavanaugh, Norman Penny, M.J. Raherilalao, E. Rajeriarison, R. Ranaivosolo, J.S. Randrianarisoa, E.F. Randrianirina, N. Rasoamananana, François Ratalata, Félix Jean Ratelolahy, T.J. Ravelomanana, H.C. Raveloson, Jere Schweikert, Darrel Ubick, Flor Vargas, Heidi Viljanen, Helena Wirta and Kipling Will for their help with collecting specimens.

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